JOURNAL *of* THE SOCIETY OF CHEMICAL INDUSTRY

CHEMISTRY & INDUSTRY

Official Organ of the Institution of Chemical Engineers, of the Coke Oven Managers' Association, and of the Federal Council for Chemistry

which consists of Representatives from

The Chemical Society, the Society of Chemical Industry, the Association of British Chemical Manufacturers, the Institute of Chemistry, the Society of Public Analysts, the Faraday Society, the Institute of Brewing, the Society of Dyers and Colourists, the Society of Glass Technology, the Iron and Steel Institute, the Ceramic Society, the Institution of Gas Engineers, the Society of Leather Trade Chemists, the Royal Photographic Society, the Mineralogical Society, the Biochemical Society, the Oil and Colour Chemists' Association, the Institute of Metals and the Royal Agricultural Society.

VOL. 52 LONDON, JANUARY 13, 1933 NO. 2

EDITORIAL

In the Service of Astronomy

THE Nile is in flood, the New Year has begun. The two events are coincident, the beginning of the year being fixed by the heliacal rising of Sirius before 4000 B.C. It is thus a fitting moment to reflect on some of the inter-relations between the two sciences of chemistry and astronomy which are so real and important. To the man in the street perhaps, there can be little connexion between star gazing and test-tube shaking, but in actual fact the progress of the astronomer is largely due to the help he has received from the physicist and the chemist, help which has been repaid in full by the contributions of astronomy to the advancement of chemistry and physics. The versatility of the spectroscope in the observatory is remarkable, it has enabled the widest variety of physical and chemical discoveries to be applied : thus the shift towards red or violet of spectral lines by pressure affords a means of measuring the pressure in stellar atmospheres; the variation of the relative intensities of lines with temperature gives a clue to stellar temperatures. The photometer, largely displaced now by photographic methods, has given the magnitude of tens of thousands of stars, and the thermopile, radiometer, interferometer, photoelectric cell and many an instrument besides have all contributed to a knowledge of the stars which is amazing in its completeness. We are more concerned to examine the help that the chemist can give to this noblest of causes. Dyes are wanted, not of the kind that grace our ballrooms and the waistcoats of our diners, but dyes which will improve the sensitiveness of the photographic plates in various regions, especially in the infra-red. Enough has not been made by us of recent success in this direction, though we have all more than admired photographs of the distant hills, taken from afar on plates sensitive only to the infra-red rays. The seeing eye of the camera has far eclipsed our own, now that it is equipped with a more sensitive retina than we possess. Another desideratum in astrophotography apparently is a reduction in the size of the grain of the most rapid photographic plates : to the astronomer such a change would be equivalent to a marked increase in the aperture of his telescope. New alloys are useful in every industry, their discovery is bringing progress in the most widely different fields. The astronomer needs them for telescope mirrors, for optical gratings, and for much else besides. The demand is for bigger and bigger telescopes, but the answer depends on the glassmaker. Telescopes now focus the object by means of a reflecting mirror which lies at the bottom of the telescope tube, the two biggest in the world having diameters of sixty inches and one hundred inches respectively. These consist of a glass disc, silvered on the front surface, which is figured to a paraboloidal form. The sixty-inch mirror is eight inches thick, weighing a ton, whilst the hundred-inch disc is thirteen inches thick and weighs nearly five tons ; its manufacture was considered a great achievement at the time by the glassmaker, but his art has continued to progress, and it is believed that even larger and better discs can now be cast. One difficulty in observation is produced by the expansion or contraction of the glass with change of temperature, which brings about a change of figure and hence a less sharply defined star image. To obviate this a glass with a lower coefficient of expansion is required, such as the Pyrex glass which has proved so useful in our laboratories, and glasses with an even higher silica content are being tried. Even better than glass for the astronomer's purpose is fused quartz, and transparent discs of this up to twelve inches diameter have been made : a problem here is the elimination of bubbles, which however, have some advantage in reducing the weight of the disc. Obviously, there are conundrums enough for the chemist to solve in helping the astronomer, who in return may be expected to make even greater contributions to chemical knowledge in the future, though nothing can be more startling than our first realization that the atmosphere of the sun was composed of hydrogen : we may be moved to write of this story on another occasion.

The New Patents Act

The new Patents & Designs Act 1932 is of the greatest importance to chemists and the chemical

industry and we publish this week the admirable paper on the Act and its relation to the chemical industry delivered a few days ago to the London Section and the Institution of Chemical Engineers by Mr. Hollins whose long experience of patents in his work for Imperial Chemical Industries Ltd. makes his opinions of great value. The new Act has many provisions of interest, one being Section 7 which amounts to a great extension of the search before granting a patent. It has long been a reproach to this country that our British search was not nearly so effective as in some other countries and that, consequently, our patents were less secure and less valuable than those in the foreign countries where the search was more exhaustive and went back to earlier years. The new section gives power to the Comptroller of Patents to cite anticipatory publications other than British specifications of the last fifty years and in fact this power is very similar to that enjoyed and used by the German Patent Office. It will take several years to make the necessary indexes before our Patent Office has as complete a search as the German Patent Office but a beginning has already been made and there is to be an additional fee of £1 which, as Mr. Hollins says, will not be grudged by anyone who desires to see our patent system rank with the best foreign systems. The discussion on the paper is of value for those who took part in it have all had experience in patent work. Dr. Levinstein called attention to the fact that in this country we were granting thirty thousand patents a year and that our patent policy was framed when Britain was mainly an agricultural country and it was desirable to foster industry. In his opinion it was now becoming desirable to restrict such monopolies. Patents have played a prominent part in the history of the chemical industry here and large fortunes have been accumulated by fortunate people or firms who have secured control of vital patents. It is remembered by us all that few of such patents would have been very lucrative had not the owners of them possessed in addition great scientific and technical knowledge, the help of a body of devoted workers engaged in research, and a vast bulk of accumulated experience. Unremitting attention to details, business acumen, and the most highly skilled knowledge of chemical engineering have been solid keels that have often prevented the barque of the patent from drifting aimlessly about the rude seas.

A Sentimental Journey

We have travelled far with our readers this past year into the by-ways and entries of chemical progress in pursuit of knowledge and improvements. "Knowledge," says Sterne, "in most of its branches, and in most affairs, is like music in an Italian street, whereof those may partake who pay nothing." Nowadays we make our journeyings by aeroplane and motor car instead of by sailing ship and postchaise as did Sterne, but it remains as true now as in his days that most of us are more interested in small things than in big, in our daily round rather than in chemistry as a whole. The talk of a barber about the buckle of his wig taught Sterne more about France than the grandiloquence of her statesmen, and even the purchase of a pair of gloves was turned by him to advantage. Chemists as a class are accustomed to observe first and reason afterwards. Our columns bear witness how much has been observed during the year, how clarity is replacing what was obscure, how chemical curiosities become first novelties and then commonplace, how the mystic abracadabra of the alchymists is all but dispelled. We extract but thirty-five grams of radium per annum, yet enough to do both untold evil if it be wrongly used, and to heal much suffering when it is in wise hands. The yearly production of indium has reached ten pounds; who knows when it will amount to tons, should a use be found for it? Though London, and perhaps Manchester and Leeds too, are no longer "a world of fog and four-wheelers" in the winter months, the fog remains because we still burn raw coal, though the swift-moving and heat-emitting motor car has pushed the fog level up to the housetops in the busy streets. We dine in coloured waistcoats, the Dyestuffs Act is to be reconsidered next year, ladies wear deeper shades to their adornment and our advantage, our colour makers have new achievements to their credit. Makers of rayon bring grist to the Law Courts, chemists work new marvels with plastics. Our food is purer and richer in vitamins, we have a new home industry in canning British fruit in British cans. The bookmaker is scientific and grows rich, the chemist remains an individualist and has still neither a Chemistry House nor one universal society. So we travel through the events of the year, a task which it is impossible to fulfil with satisfaction unless we have the Annual Reports to act as our guide. The journey is full of adventure for those who are ready to observe first and reason afterwards. Scientists are sometimes accused of being incomplete as human beings, since ideas interest us more than people. The reproach may or may not be true, but if only the critics knew how much there was to interest us in chemistry and how little in our suburban street they might expect to require our pity for knowing so little of the things which appeal to us. There was once a poet who bewailed the cruelty of his mistress in chemistry; we chemists need a poet to sing of the ignorance of others of the things that matter in our eyes. But there is world and enough for all of us in which to work and to reason, to plan and to achieve, to live happily and to play seriously. Unemployment is an ugly word in our vocabulary to-day because it connotes not leisure time but lack of means. Only the few know how to employ their leisure. If only this habit could be acquired by the masses, the shorter working day might become more practicable. There are colliers willing to produce coal but needing clothing, textile workers lacking coal but willing to work their spindles; both need sundry foodstuffs which the agricultural labourer can and will produce, all he needs is food and clothing. We all have sympathy for the three classes, and they are said to number thirty million in the world to-day. Yet the absence of a mysterious factor, for it does not seem tangible enough to call a thing, termed money or credit keeps them apart, without work, or means, or hope. What is to be the solution? We have not encountered it in our sentimental journey; who will effect the remedy?

CHEMICAL WARFARE

In April, 1932, a Special Committee of the League of Nations was set up to consider chemical and bacteriological weapons of warfare with a view to their selection for qualitative disarmament. The findings of this committee, details of which were given in CHEMISTRY AND INDUSTRY, July 1, 1932, were ultimately submitted in the form of a report to the Bureau of the Disarmament Conference, and at this stage a number of technical points were raised. These were embodied in a questionnaire to be referred back to the Special Committee for amplification, and the Committee was re-convened for this purpose under the chairmanship of M. Pilotti of Italy, the British represeutatives being Brig. A. I. Temperley, Mr. J. Davidson Pratt, Major B. H. Robertson, Comdr. G. D. Belben, and Sqd.-Ldr. L. G. S. Payne.

The report of this Committee in reply to the points raised is of considerable interest. The practical aspects of chemical warfare and its prohibition have been clarified considerably, and the recommendations made go far towards preventing any undesirable international interference with commercial affairs, with the consequent damage to chemical industry which might possibly have resulted from the well-meaning and universally-felt eagerness to arrive at the prohibition of such methods of warfare.

In the first place it is concluded that protection against the effects of chemical weapons involves the employment of individual protective devices such as masks and protective clothing, but in practice neither the preparation nor the supervision of such preparation can be entrusted to an international body. The preparation of means of collective protection, such as underground shelters etc., is an essential means of defence against chemical warfare, but here again such preparatory work cannot be submitted to the technical supervision of an international body, nor can it be governed by an international convention. It is pointed out that the testing of protective material involves the nse of poisonous substances, though in quantities insufficient for purposes of military action, but there is a risk that any obligation to publish the quantities of such poisonous substances produced for this purpose would fail in its object since it would leave out of account the experiments carried out by private industry on its own initiative. On the other hand the preparation of measures of treatment to be given to the victims of chemical warfare cannot give rise to malpractices; certain protective devices, such as masks, could be submitted to an international body for examination, and it would be possible to set up an international information and documentation service regarding protection against chemical warfare.

With regard to offensive materials, it is concluded that it would be possible to prohibit the manufacture, import, and possession of substances used for chemical warfare, but such a prohibition would be limited in value by the fact that the manufacture of such substances can be improvised by any state possessing a chemical industry. It is pointed out at the same time that no projectiles or means of projection are exclusively employed for chemical warfare, whilst it is not possible to prohibit the manufacture or possession of materials capable of employment both in peace and war, for such a prohibition would be ineffective in view of the stocks held in industrial establishments and the irreparable damage it would inflict on the chemical industry. Whilst again it would be possible to prohibit the training of armed forces in the use of chemical weapons, the practical effect of this would be small as the material used for chemical warfare is not of a specialized character. The Committee concludes with regret that no practical measures can be put forward for the prohibition of the preparation for chemical or bacteriological warfare, and with regard to incendiary warfare, whilst it would be possible to prohibit specifically incendiary shells and bombs, these are quickly and easily manufactured. The difficulty of enforcement of prohibition is stressed by the Committee, it being conceivable in theory, but not possible in practice, to exercise such a control by entrusting national or international bodies with the duty of inspecting chemical factories, making known the production capacity, character of the products, and existing stocks in the factories: such control, if it were proposed, would have to apply to the whole chemical industry, and its value is limited by the ease with which chemical warfare could be improvised. Again, it is pointed out, both the potential capacities and quantities concerned depend upon the distribution of raw material, upon industrial development, and upon entirely legitimate reasons for industrial policy, making limitation of chemical production impossible. Such limitation would only be possible in the case of snbstances exclusively used for warfare, and it is not possible to prohibit the intention (which is itself not susceptible of proof) to make use of substances for chemical warfare, whilst at the same time leaving the manufacture, import, and stocking of such substances entirely unsupervised.

The establishment of the facts of infringement of prohibition gives rise to big difficulties, and the Committee concludes that such establishment would have to be extremely rapid, affording the greatest possible guarantees of impartiality on the part of the body establishing the facts, and carried out by persons of recognized authority. Rapidity is necessary in order that an offending State should not derive a substantial military advantage, whilst certain substances such as chloropicrin and brominated ketones leave traces on the ground for only a short time, and the use of other volatile substances such as phosgene can be proved only by medical examination, which would have to be made certain before certain clinical or anatamo-pathological phenomena bad disappeared or been transformed. With regard to special measures in the event of breach of prohibition, the Committee concludes that it would be effective if all States were to give an attacked State scientific, medical, and technical assistanee in repairing, attenuating, or preventing the effects of use of prohibited weapons, but whilst the stoppage of supplies to an offending State of raw materials, products, and implements for chemical warfare might be contemplated, its effect would be limited and in any case delayed.

In this brief account it has been possible only to outline some of the more notable conclusions but the report of the Committee shows that the complex question

of chemical warfare has been studied with great thoroughness, and from every angle. It is worthy of note that this Committee is the only one to achieve unanimity in the whole history of the Disarmament Conference.

GYPSUM*

By C. L. HADDON

In the distant past, rivers containing calcium bicarbonate in solution flowed into inland seas containing sulphates etc. in solution and the sparingly soluble calcium sulphate was precipitated out. Occasionally, large single crystals known as "selenite" were formed, but generally masses of crystals were deposited which interfered with one another's growth. This sediment was consolidated in later geological ages, and thus the mineral "gypsum" was formed. In these muddy seas the sediment often contained clay and chalk, and thus gypsum is rarely pure. If the sea was very warm or contained a large amount of other salts in solution, not the hydrated form of calcium sulphate—gypsum—but the anhydrous salt $CaSO_4$ which is the mineral "anhydrite" was deposited. Thus it has been found that with a concentrated solution of magnesium chloride above 11° C. anhydrite is deposited, and below, gypsum. With a saturated solution of common salt the dividing temperature is 25° C.

With climatic changes one would expect to find gypsum and anhydrite sometimes in the same deposit, and this is so. The matter is complicated by the fact that sometimes the anhydrite has subsequently become hydrated to form gypsum. This is thought to have occurred in the huge gypsum deposit in Nova Scotia. In England, gypsum occurs in rocks of the Permian, Triassic, and Jurassic systems in strata of varying thickness and purity. To be workable commercially the gypsum must be over 90% pure and the stratum at least 8 ft. thick. The only exception to this is the extremely pure white gypsum which is worked at Cropwell. Deposits of gypsum are worked in the Midlands, Cumberland, Westmorland, and Sussex. A deposit of anhydrite is worked near Billingham. The tonnage worked in 1931 was: anhydrite in Durham 330,000 tons and gypsum in the rest of England 425,000 tons. In addition 96,000 tons were imported.

Where a workable deposit of gypsum occurs within a few feet of the surface, it is quarried. The layer of surface clay or overburden is removed, and holes are then drilled into the gypsum, which is blasted out. The detached lumps are loaded on trucks and removed to the mill to be sorted into different qualities.

If the overburden is too thick, the gypsum is mined, generally on the so-called pillar and stall system. A shaft is sunk to the gypsum stratum, and a central roadway cut through the gypsum. Branch "stalls" are cut out somewhat like a herring-bone. A roof and floor of gypsum is left and also supporting pillars between the stalls. Before a working is abandoned, it is "topped out," *i.e.*, the good stone is removed from the roof. Gypsum has been quarried or mined in England for over 500 years, originally to procure large blocks of gypsum known as alabaster. It is a soft mineral—its hardness is 1·5 to 2 on Mohr's scale—and as a consequence it was especially suitable for carving with mediæval tools. In Clifton Church, near Nottingham, are effigies in alabaster of members of the Clifton family dating back to 1403. There are other examples in York Minster of similar antiquity.

Gypsum is reduced to powder form by first passing the lumps through a crusher which reduces them to 1 inch in size, and then grinding to a fine powder, generally with millstones. The output of a pair of stones is about a ton an hour. Various industries require different finenesses of grinding.

Raw gypsum is chiefly used to-day to retard the initial set of Portland cement, to which about 2% is added. It is used also as an agricultural manure, for polishing tinplates, for mine dusting, and as a cheap filler in a number of industries. The purer forms are used as a loader for paints, textiles, and paper.

The Salts of Calcium Sulphate

In addition to the dihydrate and the anhydrous salt there is a third chemical form, the hemihydrate $CaSO_4 \cdot \frac{1}{2}H_2O$ and also allotropic forms of the dihydrate and the anhydrous salt. If powdered gypsum is heated, the temperature rises until at about 120° C. the mass takes on the appearance of boiling and the temperature becomes stationary, due to the decomposition of the gypsum into hemihydrate and water vapour. The escaping vapour is responsible for the appearance of boiling. When the change is approximately complete, the temperature again rises until at 180° C. a somewhat similar phenomenon occurs when the last quarter of the original water escapes and anhydrous calcium sulphate is left. This is an allotropic form of anhydrite and is generally known as "soluble anhydrite." If the heating is continued, the allotropic form changes slowly into so-called insoluble anhydrite which is identical with natural anhydrite. The complete change is effected by prolonged heating above 300° C.

Plaster

The commercial name of the hemihydrate is Plaster of Paris. It is manufactured in this country from powdered gypsum by two processes—the open pan process and the kettle process. In the former about 4 tons of gypsum are placed on a shallow pan heated underneath and stirred. Calcination takes about $1\frac{1}{2}$ hours. In the kettle process the gypsum is placed in a kettle holding about 10 tons. Here also there is a stirring arrangement and the period of calcination is about $2\frac{1}{2}$ hours. Each process possesses certain advantages. When Plaster of Paris with greater strength is required, as for casting pottery moulds, or in dentistry, a different method of manufacture is adopted, which provides a plaster requiring about 15% less water for gauging, and which is thus harder and stronger. Small lumps of gypsum are calcined in a muffle oven with careful temperature control, and the plaster is ground in an edge runner. This gives a different proportioning of particle size and closer packing than by grinding the raw gypsum prior to calcining. It is obvious that this latter method is costlier and it is only used when the maximum strength is essential.

The solubility of gypsum is 2 grams calcium sulphate per litre at ordinary temperatures, while Plaster of Paris is five times as soluble. It is obvious, therefore, that when Plaster of Paris is mixed with water, a saturated solution is formed, and one that is five times supersaturated as regards gypsum. Thus crystals of gypsum are deposited and more plaster dissolves until the process is complete. If the mixture of plaster and water is made into a thick cream, the deposited crystals interlock and cohere to form a mass possessing considerable strength. This process is known as "setting." With the purest Plaster of Paris procurable, this process occupies about an hour to complete, but commercial samples of plaster contain gypsum that has not been decomposed during burning; these particles act as crystal seeds which hasten the setting. The average plaster takes about 15 minutes to become hard and setting is complete in about 35 minutes. The setting speed is affected by many things. Most solutions of other salts affect it; some like potassium sulphate or common salt hasten it considerably while others like borax or ammonium citrate retard it to a matter of hours. The original Parian cement consisted of gypsum baked to a very impure form of plaster which was then mixed with about 1% of borax to retard the set. It is now manufactured on principles similar to Keene's cement.

Plaster of Paris is one of the oldest building materials in the world. In Egypt, according to Lucas, the famous authority on the chemistry of Egyptian antiquities, lime was not used prior to the coming of the Romans. Instead, a very inferior and badly made gypsum plaster was used as mortar, which served mainly as cushions between the stones. The very dry climate enabled it to have reasonable permanence out of doors. It was also used in the interior to provide a surface on which to paint: its chemical neutrality makes it ideal for this purpose, so that to-day, thousands of years afterwards, these paintings are still in good condition. The first record of the manufacture of plaster in this country was in the reign of James II.

The setting time of plaster and the slight solubility of gypsum makes it a very convenient material for making casts, and a large tonnage is still used for this purpose. The fibrous decorative plaster work in houses is one example. Potters' moulds are also made from plaster. A more important use, at least as regards tonnage, is its addition to lime plaster to quicken the set. This is almost essential in winter time.

To enable Plaster of Paris to be used where a slow set is essential, a retarder of the set must be admixed and it must be one which has no bad effect in any respect. Borax, which was used originally in Parian cement, comes to the surface as a loose white powder and it has been necessary to find better retarders. The retarder now used is made by hydrolyzing keratin with lime and caustic soda. Only about ¼% is necessary for retarding plaster. The retarder is chemically a mixture of calcium and sodium salts of complex amino acids and is immune from moulds. Both the rate of solution of the plaster and the rate of precipitation from supersaturated solutions are slowed up by the retarder. By varying the proportion of retarder, any desired time of set can be obtained.

Keene's Cement

It was stated earlier that prolonged burning of gypsum produced a material identical with insoluble anhydrite. This material is only 10% more soluble than gypsum, and therefore when gauged with water reforms gypsum at far too slow a speed to have any commercial value. There are however a number of substances which act as catalysts and speed up this reaction, the most important being solutions of other sulphates. The original plaster or cement of this type was Keene's cement. Keene took out a patent in 1836 which consisted of baking gypsum, soaking in a solution of alum, re-baking, and grinding. This process is still employed by some firms for making Keene's cement, though more modern processes are now used. A number of "dead burnt" plasters are made and sold under registered trade marks. The gypsum is burnt to dehydrate it more or less completely, and a small quantity of catalyst is added. If a large proportion of gypsum is not completely dead-burnt the plaster will have a very rapid initial set. Thus unless great care is exercised in manufacture, such plasters are very irregular in their properties.

There is a very interesting difference in the appearance of setting between Keene's cement and retarded hemihydrate plasters. Keene's sets like Portland cement and Plaster of Paris in that the whole mass gradually becomes hard at an equal rate throughout. Retarded plasters behave quite differently, remaining quite soft, then suddenly becoming hard at certain points, with the hard spots surrounded by a soft matrix of unset plaster. The hard spots slowly increase in size until the whole mass is hard. The process can easily be followed because the set plaster is very much darker in colour than the unset plaster. Within the last few years a wall plaster incorporating catalysts with powdered anhydrite has been put on the market.

Storage of Gypsum Plasters

The setting time of gypsum plasters is easily controlled by the manufacturer, and no excuse can be offered for an irregular material leaving the factory. Gypsum plasters should not be stored for long periods, as moisture is slowly picked up from the atmosphere. Three months' storage in a dry store should result in no appreciable deterioration. Prolonged storage of Plaster of Paris and plasters made from it first quickens the setting time; a longer storage results in a falling off in strength of the set plaster. With dead-burnt gypsum plasters prolonged storage produces the reverse effect—a slowing up of the setting time.

Gypsum Plasters as Building Materials

Years ago lime and sand alone were used for plastering walls and ceilings. A coating of lime and sand was put on the wall, left some weeks till it was fairly dry, and then another coating applied. A discovery was made that if Plaster of Paris was added as well, the coating became hard much quicker. This saved time and earned money because the building could be used sooner. Naturally, architects and others endeavoured to save more time and money by using plaster alone. The first success was the introduction of Keene's cement in 1836 and of Parian a little later. Of recent years a number of much cheaper gypsum plasters have been

introduced, some made by retarding Plaster of Paris and some by roughly dead-burning gypsum and accelerating the set. However, all are alike in reducing the time between the commencement of the plastering and the final decorations. These plasters have been highly successful. In the U.S. lime plasters have been almost entirely displaced by retarded gypsum plasters, and if not entirely displaced in England, lime plastering is dying.

The object of plastering a wall is to produce a smooth and pleasing surface. The starting point with a wall is a very irregular surface of bricks and mortar: with ceilings and certain interior partitions it is wooden or metal laths. The first step is to obtain an approximately level surface, which is covered later. Thus an economy can be made by mixing sand with plaster and water. On laths, where there is little absorption of water, about two volumes of sand are usually mixed with one volume of plaster. On walls the porous bricks absorb some of the surplus water, so that the plaster-sand mix is consolidated and becomes harder and stronger. This enables more sand to be used, and usually three parts of sand to one of plaster is specified. The character of the sand is of much greater importance with gypsum plasters than with lime plasters, because of the effect on strength. A good sand gives double the strength obtained with a poor sand. Loam or clay in the sand is a particular enemy, and as the coat of plastering sand in a building is relatively small, it is definitely not one of the instances where price alone should be studied. The best sand is the "clean sharp sand" which is almost always specified. "Clean" means absence of loam or other foreign materials, while "sharp" in this connexion does not imply jagged points, but a sand containing particles of all sizes giving closer packing and greater strength. A second coat of plaster or cement alone is then applied to give a smooth surface. This can be put on as soon as the first coat is hard, *i.e.*, next day at the latest. This is trowelled by the plasterer to a smooth polished finish. Actually, excessive trowelling, though creditable to the plasterer's pride of craftsmanship, is rather a disadvantage in some respects, as it causes more condensation and is not quite such a good base for papering.

With regard to hemihydrate plasters, merely retarding Plaster of Paris gives a hardwall plaster with poor working properties. The unfortunate plasterer who had to use such a material would be physically exhausted at the end of his day's work, as the labour of spreading it on a wall is heavy, while it is difficult to obtain a smooth surface. Such simple gypsum plasters are definitely very inferior to lime in ease of plastering. Gypsum plaster manufacturers have therefore directed their attention to improving the working properties of their products. On account of the poor plastering qualities of some gypsum plasters, and of all gypsum plasters say 10 years ago, with the exception of Keene's cement, plasterers adopted the expedient of admixing lime with the plaster to improve the working properties. This destroys one of the principal advantages of gypsum plasters—that permanent decorations can be applied at once. Nowadays a reputable manufacturer makes special plasters for use as a finish only, where working properties matter most, and any addition of lime to these is unnecessary. Tradition dies slowly and it is difficult to prevent plasterers surreptitiously adding lime. One great advantage of gypsum plasters over lime is the effect on decorations. The other is the time saved before the building can be used. The hardening of the lime plaster is partly due to drying out and partly to a chemical action with the carbon dioxide in the atmosphere, which gives a hard surface veneer of calcium carbonate on the lime plaster. This process requires several weeks before decorations can be attempted, and even then they are liable to damage, so that generally a cheap distemper is applied and a year later the householder has the inconvenience and expense of re-decorating. The reasons are that with paint the lime reacts with the linseed oil and saponifies and softens it. This is accentuated if any alkali salts from bricks, sand, or Portland cement are present. Moreover, many of the dyes used in wall paper colours are sensitive to alkalis and are bleached by lime. With chemically neutral gypsum plasters, neither of these things can happen and the only reason for delay in using permanent decorations is the dampness of the building.

Water used in the mortar, in wetting the bricks, and in plastering has got to be dried out, and paint or distemper which assists in keeping it confined in the walls is undesirable. Thus a wall should not be decorated until it is fairly dry. In the case of ceilings there is a large upper surface increased by the curved surface of the plaster above the laths, and it does not matter if the underneatb surface is painted at once. For repair work in dry buildings dampness need be feared only in very exceptional cases and decorating can be done at once with gypsum plasters.

The particular merits of the different types of gypsum plasters are stressed in the various manufacturers' trade literature. A committee of the British Standards Institution is preparing a standard specification on gypsum plasters, and in connexion with this the Building Research Station in its annual report for 1931 made the following comments: "The results of the year's work on calcium sulphate plasters have emphasized the good qualities possessed by plasters of the retarded Plaster of Paris type (hemihydrates) when the retarder is an organic colloid. Although this type of plaster is neither as strong nor as hard as the hard-burnt plasters of the Keene's type, it is probable that the majority is strong enough for most purposes, whilst the absence of excessive hardness may often be an advantage, in that noise and condensation are reduced. The rate of setting of these plasters is usually more uniform than that of the hard-burnt plasters, and their working qualities are often better. Their chief advantage, however, is that unless alkalis are added or are subsequently absorbed from brickwork etc., paint failures due to chemical action will not occur, although they be gauged with lime, and, even with both alkalis and lime present, quite large amounts of the former are required before failures occur, since the organic retarder is able to neutralize a certain am[illegible] alkalis." When this specification is com[illegible] it should prove a valuable safeguard to users. No plaster should ever be specified that is not guaranteed to fulfil the various tests.

A recent innovation in the building trade is the introduction of synthetic boards, which ac[illegible]bstitutes

for laths and the first coat of plaster. Examples are Thistle Board, which is made from Plaster of Paris, Insulite, and TenTesT. They are made from a very wide variety of materials and their properties as a base for plastering differ considerably. Thistle Board is composed of two sheets of a special type of paper between which is run a layer of gypsum plaster. A mixture of Plaster of Paris, sawdust and retarder are stirred up with water in a mixer of the type one sees used for concrete. It is then run on one sheet of paper resting on a conveyor belt, and the other sheet is placed on the top. The mass passes through two pressure rollers when it is cut into the normal sized boards. The plaster is then allowed to set and the boards dried out in a tunnel drier. The adhesion of the paper to the board is extremely good. Only a gypsum plaster of the hemihydrate type can be used upon some of these, while with others any kind of gypsum plaster is suitable. The architect should consult the manufacturer of the particular board he is having used before specifying the gypsum plaster to be used upon it. The difference is due to the expansion of the gypsum plaster during setting. Retarded hemihydrate plasters set completely and suddenly, expanding about 0·1% during this process. It enables the plaster to bite into the recesses in the surface of the board and grip firmly. There is no subsequent expansion. Certain other plasters, unless they dry out in the meantime, set slowly and continuously and continue to expand during this period. This results in the destruction of the bond and the plaster parts from the board. This occurs with Thistle Board, which adheres well to hemihydrate plasters and badly to other types.

Mechanical strength depends largely on the thickness of the mix. Thus a very thick mix of Keene's cement may reach a tensile strength of 1500 lb. per sq. in., whilst in a thin mix it may be only 500 lb. Other gypsum plasters are not so strong. The strength of gypsum plasters is affected by moisture, and on drying out they become about twice as strong as when still wet. *Thus if a ceiling does not collapse when newly* erected it is never likely to fall at all. So-called "fatigue" which affects steel rather seriously scarcely affects gypsum plasters at all. Tests by the American Bureau of Standards have proved that gypsum plasters gauged with three parts of sand will withstand five-sixths of their breaking load four months without fracture.

The manufacture of gypsum plasters is a relatively small industry but it is a successful and progressive one. Every year sees an increase in the tonnage manufactured and an improvement in the quality and range of the products. One of the principal reasons for this progress is the post-war introduction of the scientific control of the manufacturing processes. The raw material is analysed and selected, pyrometers are used with every calcining process, and routine tests for quality are made on the various products. These include chemical analysis and tests for setting time, strength, and fineness. The result is that consistent and reliable products only are sold. In addition, one or two of the gypsum companies employ research chemists working in well-eqnipped laboratories. Their work is to find new products, improve existing products and processes, and to give the best possible technical service to customers.

THE BRITISH DRUG HOUSES

The British Drug Houses, Ltd., was formed nearly a quarter of a century ago by the amalgamation of several old and renowned manufacturers of drugs and fine chemicals, one of these firms having a history dating back to 1714. With such a background the combined firm must have felt that it had a very worthy reputation to live up to, and that it has fully upheld this reputation is shown plainly enough by the fact that the letters B.D.H. need no explanation in any chemical or biological laboratory, where indeed they are regarded as something of a standard of purity and reliability of reagents.

Recently we had the pleasure of paying a visit to the enormous works where all the B.D.H. products are made. It will be impossible in an article as short as this, to deal at all adequately with the works of a firm turning out more than 3000 products, but we shall endeavour to convey a few of the impressions recorded during a visit that we found remarkably interesting. Prior to the war, we had begun to be very dependent upon continental supplies of laboratory reagents and fine synthetic chemicals, and in 1914, when the supply of these was cut off, B.D.H. commenced the task of filling the breach. Rather should we say that it began to build up a technique for manufacturing chemicals of outstanding purity, for the knowledge that was acquired in the production of reagents has since been extended to all the inorganic chemicals, synthesized medicinals, etc., and alkaloids, vitamins, etc. from natural materials that are now produced on a commercial scale.

One of the first departments which we saw was that concerned with the production of sodium and magnesium sulphate. Crude salt is received from overhead stores, treated to remove impurities, filtered, and allowed to crystallize in large tanks, then centrifuged and dried by passing along spiral conveyors through which hot air is blown in the contrary direction. This department gave the first glimpse of the extra careful methods employed by the firm to ensure the utmost obtainable purity. London air contains a good deal of matter in suspension, so that the air for this building, and indeed for every other department of the factory, is supplied after first being passed through a filter, whilst the tanks used for crystallizing are covered during the process to prevent any contamination from falling dust. Nearby was the department where all the microscopical stains, dyes for medicinal purposes, and the famous B.D.H. hydrogen-ion concentration indicators are prepared. This was very much like a large laboratory, for many of the products are manufactured in small quantities, even though such quantities may be sufficient to supply numerous laboratories throughout the world for a period of two or three years. These processes are controlled by very well-qualified and experienced men, a policy which is adopted throughout the works. Near to this building was that in which phenolpthalein is manufactured—a substance which has an interesting history in this country. Until a few years ago practically all the requirements of Great Britain were imported from abroad. The British Drug Houses determined the extent of these imports, spent several

The Ampoule Department

years in perfecting a production process, and ultimately installed a plant with such a capacity that not only is the home market now supplied, but an export market also has been created.

A plant of considerable interest was that in which insulin is produced. The British Drug Houses, in collaboration with Allen & Hanburys, Ltd., is one of the largest producers of this material, and has been so ever since

[illegible] of Pure Pharmaceutical Chemicals

its first introduction as a commercial product. Animal pancreases form the raw material, which is delivered fresh to the factory and immediately frozen. It is then ground to a fine state and carried to apparatus in which extraction with alcohol is effected. After treatment with various reagents the extract is adjusted to the right degree of acidity, filtered, centrifuged, and dried in low-temperature vacuum apparatus, the final product being a pure white powder with a strength of 20 units per milligram, that is, ten times the potency of Banting's original material. Every B.D.H. product must pass rigid tests before it leaves the factory, and in the case of insulin, physiological tests are adopted on groups of small animals such as rabbits, blood sugar tests being compared with those produced by standard material. In the same physiological laboratory tests are made of vitamin-containing products.

Other departments concerned with the manufacture of reagents, fine chemicals, pharmaceuticals, etc. are too many and varied to describe here, but the rigid system of testing all manufactures is deserving of mention. No product is allowed to pass from the factory to the store unless it reaches a high set of standards. Each container is marked in the department with a "not passed" label, and this can be superseded by a "passed" label only after the head of the department, or the central analytical laboratory staff has provided evidence that the product comes up to the desired standard.

One of the most recent developments has been connected with vitamin products. Many years of hard work have been given by the personnel of B.D.H. to the preparation of calciferol (vitamin-*D*) and of pure vitamin-*A* (having a potency of 6000 times that of cod-liver oil). These and other products are now prepared in relatively large and still growing quantities. One of the firm's products is "Radio-Malt," an emulsion containing vitamins *A*, *B*, and *D*, together with malt extract. Progress in the production of these dietetic materials has largely been made possible by the development of accurate methods of estimation and standardization, the spectrographic test for vitamin-*A*, and the use of the B.D.H. model of the Lovibond tintometer for the estimation of chromogens in conjunction with the Carr-Price test being notable examples.

The ampoule department provides another illustration of the careful methods which are adopted. This room is glass-walled, with only one inlet, which serves for the supply of filtered air, and a single outlet. To get into the room one must first pass through an antichamber, in which even the floor coverings are impregnated with sterilizing material. In the room itself ampoules are filled by automatic means, sterilized in autoclaves, and finally packed by girls whose hands are gloved and beneath glass screens. There are many other parts of the works on which we should like to have commented had space permitted—the extensive offices, with their high pitch of organization, the storage, packaging, and despatch departments, where everything proceeds with the rapid ease that comes from efficient management. Suffice it to say now that The British Drug Houses, Ltd., more than fulfilled our expectations of a firm that has been so largely responsible for making this country independent of foreign supplies of very many fine chemicals.

SIR FRANK E. SMITH, K.C.B., F.R.S.

Sir Frank Smith occupies two important posts that have brought him into contact with many scientific men, chemists and others, in this country: he is the Secretary of the Department of Scientific and Industrial Research and is the Secretary of the Royal Society. He was born in 1876 and studied at the Royal College of Science, distinguishing himself in physics. He was a demonstrator there from 1898 to 1900 and did research work with Rucker and Watson on terrestrial magnetism. He was appointed the first scientific assistant at the National Physical Laboratory at its inauguration in 1900, taking charge of the section dealing with electrical standards. He investigated cadmium amalgams and in 1910 developed a new form of silver voltameter that is being adopted in many countries for work of the highest precision in electro-deposition. He determined the electrical units

in C.G.S. measure, a most important piece of work carried out with great accuracy, and he has devised many instruments for determining electrical and magnetic measurements. During the war he was engaged on research work for the Forces and invented the method of measuring the velocity of projectiles by firing the shells through large coils of wire in an electrical circuit. In 1919 he was appointed Director of Scientific Research at the Admiralty and the Chemical Inspection Department of the Admiralty was also placed under his control. He occupied this position at the Admiralty until 1929 when he was appointed Secretary of the Department of Scientific and Industrial Research. He was President of the Physical Society during its Jubilee year and was awarded the Society's Duddell Medal. He has been Secretary of the Royal Society since 1929 and has been awarded the Hughes Medal by that Society. He was created a K.C.B. in 1931. In his spare time he plays golf and attends the social gatherings of learned societies in London where he has a pleasant word for everybody.

SOCIETY OF CHEMICAL INDUSTRY

OFFICIAL NOTICES

Australasian Subscriptions (*New Zealand included*) *may now be paid by members direct to the Society's account at the Commercial Bank of Australia, 273, George Street, Sydney. Receipts will be issued in due course.* This arrangement has been authorized by Council to save members loss on exchange during the period of depressed currency. The bank cannot conduct *correspondence on any matters other than the mere* receipt of payment.

Changes of Address should be notified promptly.

Subscriptions for 1933 are now due and the amount £2 10s. or $12·30 at normal rate of exchange should be sent to 46, Finsbury Square, without delay.

Members whose subscriptions are unpaid are reminded that it is the custom to withhold the JOURNAL temporarily after the first few weeks until the subscription be paid, when back numbers will be made good so long as the supply lasts.

AMERICAN SECTION

The *Perkin Medal* of the Society of Chemical Industry was presented to Mr. George Oenslager of the B. F. Goodrich Co. at a meeting held on January 6 in the Electrical Institute Auditorium, Grand Central Palace, at which Mr. A. E. Marshall presided. This award is made by a joint committee of members of the Society of Chemical Industry, the American Chemical Society, the American Institute of Chemical Engineers, the Electrochemical Society, and the Société de Chimie Industrielle, constituted as follows: *Chairman*, A. E. Marshall: *Secretary*, Foster D. Snell: J. W. H. Randall, Marston T. Bogert, Arthur D. Little, Allen Rogers, Robert J. Moore, L. V. Redman, Arthur B. Lamb, Charles L. Parsons, R. A. Witherspoon, R. L. Baldwin, Colin G. Fink, J. V. N. Dorr, F. J. LeMaistre, D. D. Jackson, Jerome Alexander. The Medal was presented this year to Mr. Oenslager for his contributions to the rubber industry, in particular in the development of organic vulcanization accelerators and of the carbon black type of tyre tread.

Mr. Oenslager's work was described by Mr. Alfred P. Jones of the Houston Properties Corp., who had been associated with Mr. Oenslager during his first years in the rubber industry. Prof. Marston T. Bogert of Columbia University, a past-president of the Society of Chemical Industry, made the presentation of the Medal, after which Mr. Oenslager gave the Medal Address, describing the early development and present use of organic accelerators. He recalled that the many types of wild rubber in use before they were replaced by the cheaper plantation rubber gave products after vulcanization which varied greatly in their physical properties. Having found that Fine Para, considered the world's premier rubber, contained a material present in small amount which was responsible for its superior qualities after vulcanization, research was undertaken to discover some substance which, when added to the cheaper grades of rubber before vulcanization, would impart to them the superior qualities of Fine Para. Many organic compounds, especially nitrogenous bases, were found to have the desired property of hastening the rate of vulcanization and improving the physical properties of not only the cheaper but also the better grades of rubber. The use of these organic compounds, now called orgauic accelerators, had become universal. Incidental with this development also had come a deep interest in applied chemistry in the rubber industry.

George Oenslager was born in Harrisburg, Pa., on September 25, 1873. After attending the schools in that city he prepared for college at Phillip's Exeter Academy and entered Harvard University in 1890, becoming greatly interested in chemistry. After graduating in 1894 he devoted two years of study to chemistry in the Harvard Graduate School. In 1896 he joined the firm of S. D. Warren & Co. as chemist at their pulp and paper mills in Cumberland Mills, Maine, where he remained for nine years. In 1905 he was appointed research chemist to the Diamond Rubber Co. This company was later purchased by the B. F. Goodrich Co. with whom Mr. Oenslager is associated at the present time. During his twenty-six years of service in the rubber industry he has employed all of his time in research, with the exception of two years which he spent as technical adviser to the Yokohama Rubber Co., Yokohama, Japan. Mr. Oenslager is chairman of the Akron section of the American Chemical Society and is a member of the American Institute of Chemical Engineers. He is also chairman of the Akron Section of the American Archæological Society. He is a member of the committee to visit the division of chemistry at Harvard University and is a member of the Harvard Fund Council. His chief diversion has been travel and he is particularly interested in the ancient civilizations of Sonthwest America. He also enjoys fishing and hunting in the wilds of Canada.

BRISTOL SECTION

The meeting of the Bristol Section on Thursday, December 15, was held jointly with the Chemical Engineering Group and the Plastics Group and the proceedings commenced with an afternoon visit to the Avonmouth works of Messrs. J. Robinson & Co., seed crushers. A most interesting time was spent and the party was afterwards entertained to tea.

At 6.45 p.m. in the University Chemical Department, Mr. N. Swindin read a paper on "The Use of Rubber in the Chemical Industry." The paper was illustrated by lantern slides, nnmerous specimens, and a working model of an acid pump. Mr. J. Arthur Reavell occupied the chair and in opening the discussion referred to the previous successful visits of the Chemical Engineering Group to Bristol.

An excellent discussion followed and a hearty vote of thanks was passed to Mr. Swindin.

Following the paper a successful dinner was held at Messrs. Horts' restanrant, Mr. Potter of the Plastics Group occupying the chair.

LONDON SECTION

A joint meeting of the London Section and the Institution of Chemical Engineers was held on Monday, January 2, when Mr. C. Hollins, B.Sc., gave a paper on "The Patents and Designs Act, 1932, and Chemical Industry." This was the first occasion on which the new Act had been discussed by chemists, and the subject proved a popular one, the room of the Chemical Society at Burlington House being very well filled when Dr. G. W. Monier-Williams took the chair. Mr. Hollins said: Patent Law in Great Britain, as in several foreign countries, has a special interest to the chemist, since it recognizes in chemistry a field of invention to which exceptional treatment must be accorded. In other fields the invention is the finished product, *e.g.*, a machine, and the patent monopoly covers the machine however it has been put together. Chemical invention on the other hand may lie either in the finished product or in the method of producing it; and the disclosure of one method does not necessarily make all other methods so obvious as to deprive them of inventiveness. This peculiarity of chemical inventions first received statutory recognition in the Act of 1919, but for many years before that date the best legal opinion restricted chemical product claims to the product of the process described and excluded from the monopoly methods owing nothing to the disclosure in the patent.

From two different points of view the special treatment accorded to chemical inventions has proved of considerable value to the industry—an industry which, it must be remembered, is in some of its branches, 40 years younger in this country than, for example, in Germany. In the first place the invention by one manufacturer of a valuable chemical product does not close that particular field to subsequent inventors, and invention is thereby encouraged instead of being discouraged. For example the patenting of Indigosols was followed by the invention of the extraordinary Soledon reaction, which leads to the same or similar products. From another point of view it is evidently good for chemical industry that the manufacturer who invents a useful chemical product is not allowed to sit back and do nothing whilst others working in the same field expand his monopoly for him.

I shall mention later how the new Patents Act has dealt with this peculiarity of chemical inventions and has revised the Section introduced in 1919 so as to bring it more accurately into line with the position as I have tried to explain it. The interest of chemists and of chemical industry is not confined, however, to Section 38A, and I propose therefore, to put before you as briefly as possible the whole of the changes introduced by the new Act, and then to examine certain of them in more detail. Apart from provisions relating to designs (with which I shall not trouble you) there are some 37 innovations in the 1932 Act, and these may be grouped as follows:

Application and Search

(1) An Application may be post-dated (*a*) by the Comptroller to the date upon which his requirements as to proper disclosure are satisfied, (*b*) at request of Applicant (with a limit of 6 months and at a fee of £2 per month).

(2) A single Convention specification may be based on two or more applications in a country abroad, but must be accompanied by a separate application form for each application abroad. The application forms must all bear the same applicants' names (but the applicant in this country may be an assignee of several different inventors abroad). The Comptroller decides whether the invention is a single invention or not, and may call for division; the divisional applications will then take their appropriate Convention dates. The several Convention dates are to be taken into account by the Comptroller or the Court in matters of anticipation etc., but the combined patent takes the date of the earliest of the applications abroad.

(3) Convention applications are open to public inspection after 18 months (instead of after 12).

(4) A Complete Specification may at the request of the Applicant be converted into a Provisional without fee.

(5) Provisional protection begins as soon as the Provisional Specification is filed (instead of being dated from that date but made effective only on acceptance of the Provisional).

(6) Completion is due 12 months (instead of 9 months) after the Provisional.

(7) The search under Section 7 is extended to include any publications within the knowledge of the Comptroller and is no longer limited accordingly to British Specifications. The fee on filing a complete specification is raised by £1.

(8) A patent may be refused by the Comptroller not only if the invention has been wholly and specifically *claimed* in a prior specification, but also if it has been wholly and specifically *described* in a prior specification or other publication.

(9) The Applicant may be required to disclaim possible illegal uses of his invention.

(10) Patents for obviously impossible "inventions" may be refused by the Comptroller.

(11) Product Claims in chemical inventions (including foods and medicines) are allowed only for the product of the process particularly described and ascertained.

(12) Mere prescriptions for mixtures for use as foods or in medicine are not patentable.

(13) Chemical samples may be furnished on the initiative of the Applicant; they are kept secret until acceptance of the Application (or in case of Convention Applications, 18 months from date of application) and are then open to public inspection (fee 1s.) with the Application itself and the Specification(s).

(14) Acceptance is due within 18 months (instead of 15), except where an appeal is pending. The usual extensions are obtainable.

(15) Sealing is due 21 months from date of application, or 25 months if an extension fee has been paid on completion or acceptance. Extension for 1, 2, or 3 months is always obtainable, and for an unlimited time in cases where sealing would, in the opinion of the Comptroller, cause hardship; the fee is £2 per month.

Opposition, Revocation, and Infringement

(1) The opposition period may be extended to 3 months if application is made before the end of the usual 2 months.

(2) An intervening publication (*i.e.*, publication, in the interval between Provisional and Complete, or between Convention date and date of British Application, of disconforming matter) is a new ground for opposition. (Disconforming matter is subject-matter introduced into the Complete, or into a British Application claiming Convention date, which is not a legitimate development from the Provisional, or from the application abroad on which a Convention application is based.)

(3) In "obtaining" cases the opponent may be awarded a patent for part of the invention if he is not entitled to the whole.

(4) "Belated opposition" may be entered within 12 months of the date of sealing (instead of 2 years from date of patent).

(5) The grounds upon which a patent may be revoked are enumerated in full, including those available by *scire facias*.

(6) A patent is not invalidated when the only anticipatory publication is a patent application made abroad more than 50 years previously.

(7) Not only a patentee, but also his predecessors in title (including the Applicant), are excluded from the benefit of Section 41 (2) (publication without inventor's consent of knowledge derived from inventor) if they have worked the invention otherwise than experimentally before the date of the patent.

(8) In an infringement action claims found invalid must be proved by the patentee to have been framed in good faith and with reasonable skill and knowledge before the Court will grant relief in respect of valid claims. This is not applicable to patents granted before 1st November, 1932. The Court may, on a counterclaim for revocation, impose terms (*e.g.*, amendment or cancellation of invalid claims made in good faith) and suspend the revocation order pending such amendment.

(9) The Section (36) on threats is re-drafted to include threats based on an ungranted patent, whether in the provisional or in the complete stage. Proof of actual infringement of what afterwards becomes a valid claim defeats an action for threats. A counterclaim can be made for the infringement which is the subject of the threats (only available after acceptance of the patent application).

Appeal Tribunal

The place of the Law Officer is taken by a Judge of the High Court, nominated by the Lord Chancellor. He may sit with an Assessor (paid by the Treasury). Rights of audience and the awarding of costs are to follow the practice formerly observed at Law Hearings by the Law Officer.

Miscellaneous

(1) A patent may issue with the consent of the personal representative of a deceased joint applicant, to surviving joint applicant(s).

(2) Where rights in an invention have been assigned the patent may issne to the assignee.

(3) On application by a joint patentee (fee £5) the Comptroller may hear and decide disputes between joint patentees as to sale of or licences under a patent, and has power to make his decision effective. Mutual rights and obligations of a trustee or personal representative are safeguarded.

(4) Any person may obtain from the Comptroller, as soon as it is available, information as prescribed by the Rules. This according to the 1932 Rules includes notice of filing of Complete after Provisional, abandonment of Application, sealing of patent, entry or application to make an entry in the register, and any information which will in due course be given in the Official Journal (fee 10s. for each item).

(5) Results of the official search will be disclosed on application (fee £1) when the Complete Specification has been accepted, or when it has been published and bas since become void.

(6) Prolongation of the term of a patent must be applied for before the patent expires.

(7) A patent may be in suitable cases be converted into a patent of addition (fee £5).

(8) Prolongation of a patent of addition is granted on application; the extension must be the same as for the parent patent.

(9) As regards "Licence of Right" endorsement, a parent patent and its patents of addition hang together; endorsement or non-endorsement of one involves all.

(10) As a condition of restoring a patent the Comptroller may require the register to be cleared by the entry of outstanding unregistered documents.

(11) A further type of abuse of monopoly is provided for. If the owner of a patent involving the use of materials not claimed in the patent uses the existence of the patent to prejudice unfairly the manufacture or sale of those materials in the United Kingdom, the Comptroller, on application and after a hearing, may order a licence (on terms) to the applicant and such of his customers as the Comptroller may see fit.

(12) Section 84, of interest only to Patent Agents and solicitors, is revised.

Those, very briefly, are the provisions of the new Act relating to patents. I pass over without further comment the alterations in the prescribed time limits for completion, acceptance, opposition, belated opposition and sealing, and various other amendments which will command ready approval, and I propose to examine a little more closely from the point of view of chemical industry the effect of the new provisions relating to:

Abuse of user patents.—By Section 38 it is forbidden to insert in any licence under a patent a condition that the licensee shall purchase from the licensor supplies of an article not protected by the patent. Such a condition is null and void, and its presence in an existing licence is a complete answer to an infringement action. This provision, originally aimed at manufacturers of unpatented machines for making patented articles, can unfortunately be evaded in half-a-dozen ways by the people it was intended to hit; and on the other hand' it is a serious embarrassment to comprehensive trade agreements never contemplated by the framers of the section. A glaring case which eludes the section is that of the foreign owner of a patent for the chief or

only use of an unpatented chemical " A." He issues no licences (and Section 38 is therefore inapplicable), but he has a verbal understanding with his customers that so long as they purchase all their requirements of " A " from him he will not exercise against them his rights under the patent. By this means he acquires a complete monopoly in the substance " A," in which neither he nor anyone else has any rights whatever. Section 27 of the old Act was useless against him; for the patented invention is being worked freely in this country, the patented article is not being imported, the demand for it is being adequately met, there is no refusal to grant licences, no conditions are attached to the purchase, hire, licence, or use of the patented article; and even if it could be proved against him in court that a British industry was being unfairly prejudiced by conditions attached by the patentee to the working of the patented process (to which he could make several very good answers), the remedy is a compulsory licence to the complainant. But the only complainant is the British manufacturer of " A," and he wants to sell the stuff, not to use it.

The Sargant Committee, to whom this anomaly was presented in evidence, appreciated the existence of the hardship, but proposed to remove it by including the infraction of Section 38 as an abuse of monopoly. Obviously, however, this does not touch the problem. There is, as I have explained, no infraction of Section 38, and in any case the remedy, viz., a compulsory licence, is useless to the aggrieved British manufacturer.

Representations to this effect were made, after the introduction of the Bill, to the Board of Trade, who were very sympathetic, and who finally agreed to Section 27 (2) (*f*) as it now stands, and to the provision of an appropriate remedy in Section 27 (3) (*d*). The effect is that (taking the illustration I have given above) if the manufacture, use, or sale of " A " in this country is unfairly prejudiced, there is an abuse of monopoly; and the special remedy provided for this particular abuse is a compulsory licence to the aggrieved manufacturer " and to such of his customers as the Comptroller may think expedient." Naturally, the customers must be *bona-fide* customers, and not people who merely purchase a small proportion of their supplies of " A " from the British manufacturer in order to get the licence. This rather suggests that the Comptroller will be invited to contravene Section 38, but doubtless he will avail himself of one or other of the half-dozen evasions I have already referred to. However that may be, I have no doubt that chemical industry will welcome this clause of the new Act, which puts an end to one of the ways in which British patents have been used to discourage British industry.

The Appeal Tribunal.—To the student of the Reports of Patent Cases the disadvantage of appeals having to be made to a series of rapidly changing law officers has long been apparent. The appointment of a High Court judge to deal with appeals from the Comptroller's decisions is an excellent move, especially as it is accompanied by power to call in an assessor in highly technical cases. Experience of the high costs, amounting sometimes to hundreds of pounds, involved in appeals under Section 26 (belated opposition) to a judge in chambers gave rise, when the Bill was first introduced, to considerable fears that a similarly high scale of costs would be imposed by the new Appeal Tribunal. As finally amended, however, the Act provides that in respect of the award of costs the practice hitherto adopted by the Law Officer shall be followed. The assessor (in cases where one is needed) is to be paid by the Treasury. The judge appointed by the Lord Chancellor to be the Appeal Tribunal is Mr. Justice Luxmoore, who has had very considerable experience in patent actions of all kinds.

It is in connexion with Section 21 appeals that some disappointment and dissatisfaction will be created by the new Act. Section 21 deals with amendments after acceptance. These must be advertised, and may be opposed, in which case there is a hearing. The decision of the Comptroller was, under the old acts, subject to appeal to the Law Officer. The new Act divides the amendment cases into two groups—those concerning accepted but unsealed patents, and those concerning sealed patents; appeal lies in the first group to the Appeal Tribunal, and in the second group to the High Court. That means that a poor inventor, who tries to amend a granted patent, is in effect debarred from appeal against the Comptroller's decision, since the costs would be High Court costs and beyond his means. It has been argued that amendment of granted patents is usually the preliminary to infringement proceedings, and that therefore the appeal should properly be to the court. On the other hand, there can surely be no better appeal tribunal on such matters than the patents judge specially appointed for the purpose. The Board of Trade have suggested that it is a matter of principle that appeals before grant should go to the Appeal Tribunal (or Law Officer) and after grant to the court. This is a principle which seems to have been newly invented, and, in my opinion, it has no substance. For fifty years appeals under Section 21 on sealed patents have been heard by the Law Officer; appeals against refusals by the Comptroller of applications for design registration lay to the Court (and have only now been transferred to the Appeal Tribunal); appeals against cancellations of design registrations (corresponding with revocation of granted patents) were also heard by the Court and are now transferred to the Appeal Tribunal. For the sake of a meaningless and illusory uniformity, the costs of appeal on amendment after grant have been enormously increased. It would, I submit, have been far better to bring Section 26 into line with Section 21 and allow appeals on belated oppositions to be heard by the Appeal Tribunal, which as now established is peculiarly fitted for such a task. No amount of confidence in the justness of his case will enable the patentee of moderate means to risk a small fortune on an appeal to the Court.

Chemical product claims.—The much debated Section 38A in the old Acts provided that in inventions relating to chemical processes, product claims must be restricted to the products " when prepared or produced by the special methods or processes of manufacture describe and claimed or by their obvious chemical equivalents." The word " special " is the cause of the trouble. In " M's Case " (39 R.P.C., [1922], 261) the Law Officer held that the word must be given a meaning, and he

gave it one which enabled the Comptroller to disallow chemical product claims in all cases where the process *qua* process was itself not a "special" one; and it was but a small step from that to the requirement that even the process claims must claim a "special" process and not the more novel application of a known chemical reaction.

But it must be evident that the word "special" was *not* intended to be fraught with such wealth of meaning: indeed the clause conveys correctly the intention of its framers when the word is omitted altogether. The Sargant Committee favoured this view in their excellent discussion of the matter (pars. 174–183 of the Report), but suggested the substitution of "particular" for "special." But that word would have had to be given a meaning; and since no meaning was intended, any meaning must be the wrong one.

The clause as it now stands nullifies the decision in "M's Case." So long as the process is in fact particularly described and ascertained (as is required by Section 2) there can be a claim to the product of that process, even though the process itself, *qua* process, is not of such novelty or inventiveness that it can properly form the subject of a separate claim. A chemical invention, as, for example, a new azo dye or rubber accelerator, frequently relies for its inventiveness and novelty on the product itself rather than on the method of producing it. Mere variation of the starting materials, when there is practical certainty that the process will work, is not a sound basis for a process claim, for we have long passed the days when Dewar could say with truth: "There is no prevision in chemistry."

When the full effects of the amended Section are realized it will, I think, be appreciated that this is one of the outstanding contributions of the Act to patent law as it affects chemists and chemical industry.

Extension of search.—The amended Section 7 is very modestly worded. "If it is within the knowledge of the Comptroller" that an anticipatory publication other than British specifications of the last 50 years exist, he may cite them. In fact, however, apart from the limitation to 50 instead of 100 years, this gives the Comptroller exactly the same power to cite publications as is possessed by the German Patent Office. It will, of course, be many years before the necessary indexing and filing of publications by the Patent Office reaches that stage of completeness which will make the British search as thorough as the German. A beginning has, however, been made, and the addition of £1 to the fee on filing a Complete specification (making a total of £6 for 4 years' protection) will not be grudged by anyone who desires to see our patent system rank with the best foreign systems.

Refusal of patents for inventions contrary to natural laws.—This clause has been introduced expressly to enable the Comptroller to refuse patents for perpetual motion machines, of which a surprisingly large number are applied for every year—usually by foreigners who use the rather impressive Letters Patent to impose on the more gullible of their countrymen.

The interest of the new provision to chemists lies in the power now given to the Comptroller to decide such matters within the limited terms of the Section. The invention must be "*so* obviously contrary to well-established natural laws that the application is frivolous." Some of you, I do not doubt, would be glad to see the Comptroller given much greater powers with regard to subject-matter. I am a conservative on this question (in spite of the very persuasive paper which Mr. Potts read to the British Association in London in 1931), but I have no qualms that Section 75 will be used by the Comptroller to kill chemical inventions merely because he does not understand them.

Grounds for revocation.—Prior to the new Act the statutes merely stated that a patent could be revoked on any of the grounds upon which, before 1884, it could have been revoked by the old process known as "*scire facias*." Case law has contributed a number of such grounds, and in the 1932 Act these are enunciated in statutory form for the first time. Now it is by no means an easy task for the draftsman to summarize the effect of a long and weighty judgment of the Court in a single pithy paragraph; and once that pithy paragraph has become law it is not permissible for counsel to support his own gloss upon it by reference back to the judgment on which it may or may not have been founded. The wording chosen by the draftsman must therefore in all cases be narrowly scrutinized.

Of the sixteen grounds for revocation now set out in Sect. 25, all merit careful attention, though some are of more particular interest to chemists than are others. They are as follows:

(*a*) "That the invention was the subject of a valid prior grant." It is to be noted that the validity of the cited patent can be called in question.

(*b*) "That the true and first inventor was not . . . one of the applicants for the patent." The question of inventorship in inventions arising out of departmental research is not always easy to decide. The name of each person who has made any inventive contribution to the work should, as a matter of precaution, be included. During its passage through the Patent Office the specification may be stripped of the features originally deemed to constitute the major part of the invention, and may finally emerge in a form containing only minor features of which the true and first inventor was some laboratory assistant whose name does not appear.

(*c*) "That the patent was obtained in fraud of the person applying for revocation."

(*d*) "That the invention is not a manner of new manufacture as contemplated by Sect. 6 of the Statute of Monopolies."

(*e*) "That the invention is not new." This is subject to the provisions of Sect. 15 (1), Sect. 30 (12), Sect. 41, and Sect. 45, which relate to prior grant to or publication by one who has obtained knowledge of the invention by fraud, to the use of war inventions by the Admiralty, to the limiting age for prior specification, to exhibitions and to papers read before learned societies.

(*f*) "That the invention is obvious and does not involve any inventive step" over prior art.

(*g*) "That the invention is not useful." This, of course, means that the invention does not work. It also includes cases where the invention lies in the introduction of an additional and wholly unuseful

step into a known process without affecting the end-result.

(*h*) "That the complete specification does not sufficiently and fairly describe and ascertain the nature of the invention and the manner in which it is to be *performed*."

(*i*) "That the complete specification does not sufficiently and clearly ascertain the scope of the monopoly *claimed*."

(*j*) "That the complete specification does not disclose the best method of performance of the invention known to the applicant for the patent at the time when the specification was left at the Patent Office." The wording here is unfortunate, and does not seem to me to be supported by case law. In all the cases I have been able to find the ruling is that a patentee who, knowing that method which is the best, wilfully conceals it, deserves to lose his patent. Nowhere can I discover any suggestion that a patentee has not done his full duty in this respect when he has disclosed in good faith the method he considers at the time to be the best.

During the passage of the Bill through Parliament a strenuous but unsuccessful effort was made to have the wording altered to: "... does not disclose the method of performance of the invention known to be the best by the applicant. ..." The Board of Trade contends that this was not the meaning intended, and insisted on retaining the present wording. It is just possible that an ingenious counsel may be able to persuade the Court to read into the words as they stand the meaning they would have had if the amendment had been adopted. In that case no harm will have been done, but the earliest opportunity should be taken to alter the clause so as to represent accurately the case law on which it is based. The chemist will see many objections to the phrase "the best method." What, for example, is the best method of sulphonating anthraquinone? Is it "better" to leave 40% of the anthraquinone unattacked, or to use up all the anthraquinone and have to separate out the disulphonic acids formed? What is "best" depends on many factors which have nothing to do with the inventive act for which the patent is the reward. This ground for revocation should be based on lack of good faith, or on deliberate concealment of matters useful to the invention, and the phrase "best method" should be discarded altogether.

(*k*) "That the patent was obtained on a false suggestion or representation." If the application for a patent is bolstered up by allegations of non-existent advantages or by promises which are unfulfilled, the grant is void. This is a warning to those who expect their patent agent to be also a publicity agent.

(*l*)—(i) "That disconforming matter introduced into a complete specification was not new at the date of the complete, or was not invented by the applicant."

(ii) "That the invention claimed under Convention is not the same as that applied for in the basic application abroad."

(*m*) "That the primary or intended use or exercise of the invention is contrary to law."

(*n*) "That the patentee has contravened or has not complied with the conditions contained in the patent." These conditions seem to be (i) payment of prescribed fees, and (ii) supply of the patented articles to the Government, whenever required, on terms prescribed and at reasonable prices.

(*o*) "Prior secret working of the invention except by the Government or its agents." This finally settles a vexed question. If, however, the prior working is experimental, the patent is not invalidated.

An interesting question is whether the product of such experimental working may be sold for profit. That commercial working may still be experimental is clearly contemplated by Sect. 41 (proviso) where the words are "commercially ... otherwise than for the purpose of reasonable trial." There can be no serious objection to an experimenter recouping himself for the cost of his experiments by selling the product; but profitable sales make the experimental nature of the work somewhat suspect, and throw the burden of proof very definitely upon the patentee.

(*p*) "That in the case of inventions relating to substances prepared or produced by chemical processes or intended for food or medicine the Specification includes claims which under Sect. 38A cannot lawfully be made." A product claim without limitation by reference to the process might, for example, be admitted by the Office under the impression that only physical and not chemical changes were involved; subsequent proof that the process was chemical would be a ground for revocation. Alloys produced by the melting together of metals may present a difficulty owing to the formation of chemical compounds between two or more of the ingredients. If only a minor proportion of such compound is formed and the alloy owes its value and utility rather to the uncombined ingredients than to the presence of the compound, it is probable that the process would be deemed to be physical and not chemical.

I ought to remind you, in concluding my remarks on Sect. 25, that useful criticism can only be directed to variations of the statute from the case law. The mere deletion of one of these grounds for revocation from Sect. 25 (if it truly interprets the case law) leaves the law exactly where it is.

On the whole I feel sure that chemists will agree that the new Act has greatly advanced the Patent Law. No act is so good that it could not be better, but we have at least been given a not inconsiderable instalment of reform. I may perhaps be permitted to suggest that in the next Patents Act, apart from the adjustment of certain matters to which I have called your attention, there should be a provision giving the Comptroller a further instalment of power over subject-matter. I have already mentioned that my views on this question are conservative. The new Sect. 75, however, suggests a method of compromise between those who favour the German system, *i.e.*, complete control over subject-matter by the Patent Office, and those who would leave all such matters to the Court. Let the case law be searched and a number of guiding rules laid down (as in Sect. 75) within which the Comptroller shall have power to refuse a patent for want of subject-matter, but outside which he shall have no power of refusal. Any attempt to find a satisfactory statutory definition

of "manner of new manufacture" must fail; the guiding rules I suggest, however, would not aim at completeness, but rather at the exclusion of the masses of paper patents which under our present system are a burden to the inventor and the manufacturer alike.

In the discussion which followed, a number of speakers congratulated the lecturer for the lucid way in which a highly complex subject had been presented. In opening the discussion Mr. F. Heron Rogers said that the greatest achievements of the new act appeared to be the extension of search and examination for novelty to publications other than published British Specifications. This was an immense step forward; in Germany, U.S.A., and other countries, the world-wide search which was made enabled the inventor to know if the subject-matter of his invention was novel or otherwise, but in this country, which initiated patent practice, the inventor was only told what had been published in this country. A start had now been made in establishing the records of other countries, but it would obviously take time before these would be of the utmost benefit. The speaker pointed out that post-dating with the new extension of time for sealing was of great convenience in facilitating the time for grant of Letters Patent from America. He did not agree with giving wide powers to the examiners on the question of subject-matter; that which might appear impossible subject-matter to-day was often the possibility of to-morrow. It was better to go slowly in extending such powers. Dr. F. H. Carr thanked the lecturer for the exposition of the new act which had been given to chemists for the first time, and paid a tribute to the very active part Mr. Hollins had taken in the forming of the Act. It was fortunate for chemists that the committee which considered these matters had had the services of one who combined such encyclopædic knowledge of patent law with a knowledge of chemistry. Mr. H. D. Elkington pointed out that some of the Sections of the New Act were already in operation. In December he had several cases where the examiners had cited German Specifications under the provisions of the new search powers. He believed that the Comptroller should be given wider powers of considering subject-matters in opposition proceedings. He stressed the point that it was essential to refuse fictitious inventions in the application stages, rather than allow them to become patents. The revocation of a patent was often extremely costly. Mr. Elkington pointed out that if the new Appeal Tribunal was a success, appeals under Section 26 should be taken by the Appeal Tribunal and not by the High Court. He instanced a case where in a two days' hearing of such an appeal without any witnesses the costs amounted to approximately 350 guineas. Dr. Levinstein expressed the view that it was becoming necessary to take up a different standpoint with regard to patents. Originally these had been granted when England was an agricultural country, and as such they served to stimulate industry. This was not now the case, and it was becoming necessary to restrict such monopolies. At the moment we were granting some 30,000 patents every year. He was very strongly in favour of extending the powers of the Comptroller considerably. He suggested that there was no way of making patent litigation cheap, and the main aim should be not to make the way easy for litigation, but to limit the granting of monopolies. Mr. G. S. W. Marlowe said that with regard to the high cost of appeal to the High Court from a decision of the Comptroller, it was the "taxed costs" which should be taken into account. The real expenditure might be very different, due to the fact that the matter might be of such importance as to warrant the employment of highly-skilled, and therefore expensive, men. He greatly deprecated the extension of the powers of the Comptroller to decide on questions of subject-matter, which would doubtless be to the benefit of patent and legal advisors, but not to the impecunious inventor who could not afford to employ such men; the result would be to discourage such men and hinder progress. The proposal would also lead to heavy expense in connexion with the grant of patents whose commercial value was as yet unproved, which might be allowed to lapse, and which would be superseded by other or more valuable patents. Dr. F. B. Dehn did not anticipate any marked change in Patent Office practice owing to the amendment of Section 38A, as his experience showed that the Comptroller had for some years been administering the Section as though it had already been amended. He was definitely opposed to the extension of the Comptroller's powers as regards subject-matter, and instanced the difficulty often experienced in Germany owing to the wide power employed by the German Examiners. He drew attention to the serious difficulties often created by the fact that communications between patent agents and their clients were not regarded as "privileged" as were similar communications of solicitors, and he regretted that the new Act had done nothing to remove this difficulty. He criticized the action of the Chemical Patents Committee who had given evidence before the Sargant Committee in support of compulsory dedication of medical patents to the public—a proposal which was revolutionary and one which had not been submitted, much less approved, by the organizations on whose behalf the evidence was given. Mr. W. H. Ballantyne said that the various attempts to make important changes in our patent law during the last 30 years had been unfortunate. The Section 25 of the new Act appeared to have many ways of upsetting a patent, but chemists should not be afraid of utilizing the patent law on this account; they did not use the patent law enough. Until the House of Lords had interpreted some of the clauses of the new Act, the former principles of British Patent Law would probably still survive. Mr. H. J. W. Bliss said that a point arose with regard to patents of addition which would be of interest to firms holding a large number of patents. It seemed that the purchaser of two patents by separate inventors might, on becoming the registered owner of both, convert the second into a patent of addition of the first.

Mr. Hollins commented briefly on the points raised in the discussion. Interest had mainly centred on the powers extended to the Comptroller, and he was firmly convinced that if such powers were to be extended, the extension should be by gradual instalments. The proceedings terminated with a vote of thanks to Mr. Hollins for his excellent paper.

MANCHESTER SECTION AND FOOD GROUP

The first joint meeting of the Manchester Section and the Food Group of the Society was held at the Engineers' Club, Manchester, on January 6, under the chairmanship of Dr. T. Callan, who was supported by Dr. R. H. Pickard, F.R.S., Dr. L. H. Lampitt, and Prof. H. Raistrick.

In the unavoidable absence of Prof. J. C. Drummond, Dr. S. W. F. Underhill discussed "The Conservation of Vitamins in Food Manufacture," outlining their general properties, with particular reference to the effects of heat, oxidation, alkalis, and acids on their stability.

Miss K. Culhane (in collaboration with Dr. Underhill) discussing "The Need for Standardization of Products containing added Vitamins," remarked that whilst it was most desirable that the basic materials should be improved, in most cases the only way of improving the vitamin quality of food was to add vitamins in the most convenient form. It was therefore necessary that such concentrates, or the foods after their addition, should be standardized to ensnre (1) that a sufficient amount of vitamin was present, (2) that the different vitamins were present in the correct proportions, and (3) that they were not present in too great amounts, though the last point was of little importance to the consumer, there being little or no chance of toxic effects from added vitamins. There was some good evidence that vitamins need to be taken in proper relative proportions; for example, vitamin-*D* produced its effects best in the presence of vitamin-*A*. Again, a relationship between vitamins *A* and *B* had been demonstrated, whilst according to Grant the action of vitamin-*D* is related to that of vitamin-*C*. This influence of one vitamin upon another, continued Miss Culhane, was further complicated if one considered also their relationships to mineral substances. In order to guard against the possibility of deleterious effects due to vitamins being present in foodstuffs in the wrong proportions, the quantity added should be standardized. If however, the foodstuffs are not standardized with regard to their vitamin content in the finished state, it was quite possible for a manufacturer to be adding them to no advantage inasmuch as they might be destroyed during the manufacturing process. By means of adequate tests at every stage he could follow any losses and devise means for preventing them. Such tests must almost invariably be of a biological nature in which the error was necessarily greater than in chemical estimations, and the manufacturer must make the necessary allowance for this. Using an adequate number of animals the error for the tests of the different vitamins might be taken as $\pm$ 30% for vitamin-*A*, $\pm$ 20% for vitamin-*B*, $\pm$ 30% for vitamin-*C*, $\pm$ 15% for vitamin-*D*.

In an address on "The Vitamin Content of Natural Products" Mr. A. L. Bacharach remarked that the chemist in control of food manufacture had, broadly speaking, two main functions. His first duty was to control the quality of the manufactured product; this should contain everything necessary to satisfy the explicit or implicit legal standards associated with the description of the product, and of course, to substantiate the claims made for it by the manufacturer. His second duty was so to organize his supplies of raw material as to give him the maximum chance of obtaining the finished product he desired. This did not of course, necessarily mean that his raw material should be the richest available source of any particular ingredient desired in the finished product. It might well be that a less potent source contained the required ingredient in a more stable form than some other source in which it was present to a greater extent, and here he would have to balance the different factors affecting production costs with a nicety that would depend partly upon his personal skill and partly upon the amount of information available. Pointing out that we were barely at the beginning of understanding what the functions of the various vitamins were, Mr. Bacharach remarked that we did not know, in terms of physics and chemistry, to the slightest extent how any one of them acted in the human or other animal organism. Nor had we the remotest idea of their rôle in the physiology of the plants that gave rise to all but two of them, or in the animals that were able to synthesize the two vitamins *A* and *D*. There was an enormous field for research, but he would like to put forward a plea not for more research as such but rather for a much closer co-ordination of this research, not only within itself and amongst the various workers already engaged in the technique of vitamin investigation, but, and more especially, in relation with the agronomist and plant physiologist, and to a less extent, the animal physiologist also.

Prof. H. E. Armstrong, F.R.S., who opened the discussion, said that Mr. Bacharach had made it clear that any action on the part of manufacturers on a matter of this sort was altogether premature. We were quite clear on general evidence that these various "condiments" were essential, but we also knew that we produced in ourselves a variety of "condiments" which had to be used along with them, and if there was not a proper balance between those produced outside by the plant and those produced within us, we were not in a healthy condition. The one thing we had to realize was that the whole matter was a question of balance, and to be carried away by experiments on guinea pigs and rats and things of that sort, to the extent that we were being, was altogether irrational. Before we talked about standardizing these things we ought to know something about them. Why, he asked, did not the Medical Research Council see the need of carrying this thing through logically and scientifically instead of allowing a number of competing workers to put forward untested observations which told us nothing?

Mr. Bacharach remarked that he did not accept Prof. Armstrong's interpretation of his remarks and the implication that we ought in our manufacturing practice to ignore the admittedly incomplete knowledge already won. At worst, we knew a considerable amount about the absence of vitamins from particular foodstuffs, and this knowledge could be taken into account when making claims for manufactured products. Actually however, it was legitimate to go considerably further. "This product contains *x* per cent of *X*, a substance found to be rich in vitamin-*M*, and the methods of manufacture are such as to cause no significant loss of the vitamin" was a claim which, if true, could be made quite honestly

and should mislead no one. Everything depended on the manufacturer's possessing, and acting on, adequate technical knowledge, which meant employing people with the requisite scientific training and also giving them real influence over the statements made by the manufacturer's advertising and publicity departments.

Mr. H. Shaw questioned the statement of Dr. Underhill that rats did not require vitamin-C, and suggested that a view more generally held was that these animals were themselves able to synthesize the vitamin. Mr. Bacharach supported this view, and quoted the work of Harris. The livers of rats totally deprived of vitamin-C in their food were found to contain this vitamin, and were able, when fed to other animals, to correct a scorbutogenic diet. Mr. Shaw mentioned also the recent suggestion of Rygh and his co-workers that vitamin-C was probably a complex containing methyl*nor*narcotine and a uronic acid. They claimed that a mixture of methyl*nor*narcotine and glycuronic acid showed an antiscorbutic activity possessed by neither constituent alone. The speaker went on to say that Dann had examined glycuronolactone, methyl*nor*narcotine, and mixtures of the two, and none had shown antiscorbutic activity. In view of these flatly contradictory results, what measures of confidence could be placed in the method of biological assay? In reply, Dr. Underhill suggested that very little reliance could be placed upon the work of Rygh, as much of it had been shown to be unsatisfactory.

MONTREAL SECTION

The regular monthly meeting of the Montreal Section of the Society of Chemical Industry was held on December 14 in the Windsor Hotel at 8 o'clock. Dr. O. Maass, chairman of the Montreal Section, presided. Dr. Maass called on Mr. M. L. Davies, president of the Canadian Chemical Association and past-chairman of the Toronto Section of the Society of Chemical Industry, to say a few words with regard to the Canadian Chemical Association. Mr. Davies stated that the Canadian Chemical Association was making rapid progress in Hamilton, London, and Saint Catherines and that there was great enthusiasm wherever he went. He expressed his pleasure at the privilege of attending our meeting. The chairman then called on Father Alexandre Vachon, Head of the Chemical Department, Laval University, Quebec, to give his paper on "The Romance of Alchemy."

Father Vachon said that alchemy was not a get-rich-quick scheme, a patent medicine, nor a foolish attempt to bring heaven on earth. It was a philosophy and an experimental science and the change of base metals to gold was its end only in so far as it would bring proof of certain philosophies. The alchemists' belief in transmutation was a logical result of their philosophy that all metals were merely different forms of the same prime matter. Believing that gold was the seed of all metals, they felt that if a metal happened to be base, this was merely an accident which could be remedied by the removal of the base qualities by transmutation. Hence the conception arose of the philosopher's stone, a medium by which base qualities could be obliterated. This stone was considered efficacious not only in creating wealth but also in providing man with his two other heart's desires, health and youth.

Authentic chemical facts, misunderstood by the alchemists, apparently provided them with support in their belief. Iron in a solution of copper sulphate became coated with copper; alloys of base metals achieved the glitter of silver and gold; smelting ores yielded metals "through the loss of ignoble qualities." Most of the alchemists were sincere searchers after truth, Father Vachon declared, and they made real contributions to the sum of human knowledge. They discovered and prepared many new and important chemical compounds and procedures; they investigated the medical properties of the compounds of many metals; they combined speculation with laboratory facts, laying the foundation of modern chemistry. Many of them were in the employ of kings and, like the modern chemist working for an industrial company, they were often not allowed to reveal their discoveries. But even when they did put their results into writing, they employed such flowery symbolism and allegory that the facts are lost in the images.

Father Vachon then read extracts from two mediæval poets' works on alchemy, "The Romance of the Rose" and "The Complaint of Nature," the latter sounding the modern note by blaming alchemists for burying themselves in books instead of imitating nature. In concluding, Father Vachon showed that present-day thought had gone back to the idea of transmutation, for which nature had provided evidence in radioactive processes. While this could not be done practically on a laboratory scale, possibly some catalyst—a modern philosopher's stone—might be discovered which would make this wonder a daily occurrence. Regarding the change of lead to gold, however, if the precious metal became as plentiful as the base, its value would vanish in the same ratio.

Dr. W. H. Hatcher moved a vote of thanks to the speaker for his admirable address, which was very much enjoyed by all present.

Dr. O. Maass stated that the following had been elected delegates to the Council of the Canadian Chemical Association: Messrs. T. W. Smith, D. Lorimer, O. Maass. He stated that a fourth delegate was required and a resolution was moved by Mr. T. W. Smith that Mr. M. C. C. McFee be elected the fourth delegate; this was carried. The meeting then adjourned.

SOCIETY OF GLASS TECHNOLOGY

The 149th meeting of the Society of Glass Technology was held in London on December 13 and 14, 1932. Two sessions were held.

The first was held in the Caxton Hall, Westminster, on the evening of Tuesday, December 13, and was a joint meeting with the Illuminating Engineering Society, the president of the latter Society, Lieut.-Commander H. T. Harrison, presiding. Three papers were presented and discussed; the first by S. English, D.Sc (Messrs. Holophane, Ltd.), on "Opal Glass. A Résumé of the Work of the B.S.I. Sub-Committee

ELG/3/2 on Light-Diffusing Glass." Dr. English stated that, following the Bellagis Meeting of the International Illumination Congress in 1927, the lighting fittings committee ELG/39/3 of the British Engineering Standards Association (now British Standards Institute) set up a Panel "to draw up definite proposals on the subject of diffusing glassware for international consideration." The literature available on the subject was found inadeqnate and in March, 1928, the Panel recommended that the National Physical Laboratory be asked to undertake researcb in order to provide definite data. The lines of the research were snch as to provide information on (1) the reflexion and transmission ratios of various opal glasses, and (2) the possibility of using the reflexion transmission ratio as a criterion of the diffusing properties. The first report from the N.P.L. dealt with tests on a series of opal spheres of uniform dimensions but varying weigbts all blown from the same melt. It was found that the falling off in transmission was roughly parallel with the increases in weight, while the increase in reflexion was roughly proportional to the increase in weight. Filament visibility was only of use as a general guide, owing to the variation in thickness of the spheres. In a second report, largely of a theoretical nature, were given the characteristics of an opal glass which it was necessary to measure in order to fit numerical values into equations connecting the various featnres and properties of the glass.

A third report rounded off various sections of the work.

The next paper was on "The Theory and Specification of Opal Diffusing Glasses," Part I, by J. W. Ryde and B. S. Cooper, and Part II, by J. W. Ryde, B. S. Cooper, and W. A. R. Stoyle.

In presenting this paper Mr. Ryde gave a critical survey of attempts which had been made to formulate a general theory of the diffusion of light by small particles. The new theory formulated by J. W. Ryde and B. S. Cooper in 1931 (Proc. Roy. Soc., 1931, **A, 131**, 451 and 464) formed a broad basis upon which numerous practical problems concerning opal glasses could be built, and the case of spherical globes surrounding a light source had already been given in detail. The present paper gave the theory in a convenient graphical form in which it could be applied readily to questions such as the efficiency of light fittings. The scattering coefficient of a glass, and the proportion of the incident light scattered, depended upon the wavelength of the light used, and for gas-filled lamps the effective wavelength was taken as $5 \cdot 7 \times 10 \cdot 5$ cm. Knowing the scattering coefficient of a glass it was possible to calculate the minimum wall thickness necessary to obscure completely the source, and conversely, given the lamp rating, globe diameter, and wall thickness, the scattering coefficient could be calculated. Having found this value, measurements of this coefficient enabled glasses to be tested as to suitability for particular fittings.

A simple method of measuring wall thickness of a globe consisted in weighing the globe, measuring its surface area, and calculating the mean thickness, assuming that the relative density is 2·5. If w be the weight in grams, A the surface area in sq. cm., then X, the thickness, is given by the equation $X = \frac{0 \cdot 4\,w}{A}$. A globe suitable for a 100-watt lamp was found to have thickness varying from 0·138 to 0·352 cm.

In connexion with the order of merit of diffusing glasses to be used for globes, the eight-output ratio of single sample fittings would not in itself be sufficient to assess the relative suitability of various glasses, hence it was proposed to take as the figure of merit the value of the transmission factor for a complete spherical globe corresponding to the least wall thickness which would completely obscure the source, yet give adeqnate strength. This should, for satisfactory glasses, be greater than some 0·90.

Consideration of the specification of opal glassware for lighting fittings by the B.S.I. Sub-Committee dealing with diffusing materials, resulted in a desire to amplify the existing Standard Specification for illuminating fittings. This was possible, the necessary conditions being (1) the efficiency, measured in a specified manner, must be greater than a given value, (2) the thickness must not be less than a certain minimum, and (3) the light-source must not be visible through the globe.

The third paper was by W. M. Hampton, Ph.D., B.Sc., F.Inst.P. (Messrs. Chance Bros. & Co. Ltd.), on "Some Aspects of the Manufacture of Opal Glass." Dr. Hampton enumerated the factors which had been responsible for the great iucrease in opal glass manufacture in this country during the last three or four years, and showed how our knowledge of the underlying properties of this glass had been investigated. Following upon the tendency to use light sources of greater brightness there had come a demand for globes of diffusing material to reduce the brightness to a comfortable value. As little light as possible, however, had to be lost in this process. The development of a suitable opal glass to comply with these requirements was described. The oxide markedly increased opacity, but reduced the light output ratio considerably: change from soda to potash slightly increased the opacity for a given fluorine content; boric oxide used in part substitution for silica gave a greater light output ratio, but decreased the opacity seriously. The control of iron contamination was very important, and the use of decolorizers was to be avoided as far as possible.

The importance of founding control in the production of an opal glass for flashing was stressed, since the coefficient of expansion of an opal glass varied, depending upon the rate of crystal growth. The advantage of a flashed opal over a "through coloured glass" lay in the margin of adjustment of intensity possible by altering the thickness of the opal without changing the thickness of the finished sheet. Opal glasses flashed on to coloured glass such as are in demand for mural decoration gave results which could not be obtained with a coloured pot opal.

The Second Session was held in the Science Museum, London, on the afternoon of Wednesday, December 14, with the president, Edward Meigh, Esq., M.B.E., M.Sc., in the chair.

A paper on "A Further Systematic Study of the Glasses containing Boric Oxide and Silica" was given by Dr. E. J. Gooding, B.Sc., Ph.D., and Prof. W. E. S. *Turner*.

This paper was read by Dr. Gooding, who gave as an introduction a brief historical survey of the use of borax in glassmaking.

The *results of experimental work covering glass* compositions of various systems showed:

(1) For the series sodium diborate–boric oxide: (*a*) A maximum in the annealing temperature-composition curve at 75% B_2O_3. (*b*) *A nearly linear relationship* between density and composition. (*c*) A minimum in the thermal expansion-composition curve at 85% B_2O_3.

(2) *For the series sodium metasilicate–boric oxide*: (*a*) A maximum in the annealing temperature-composition at 45% B_2O_3. (*b*) A pronounced bending in the density-composition curve at 30—45% B_2O_3. (*c*) A minimum in the thermal expansion-composition curve at approximately 60% B_2O_3.

(3) For the series sodium metaborate–silica: (*a*) A linear relationship between annealing temperature and composition. (*b*) A maximum in the density-composition curve at 47·5% SiO_2. (*c*) A nearly linear relationship between thermal expansion and composition.

A complete analysis of all expansion curves was given, an investigation of the influence of strain in the glass made, and comparison obtained with a few results of other workers.

The final paper was by M. Parkin, M.Sc., and Prof. W. E. S. Turner, D.Sc., on "Decolorizing by Selenium in Batches containing a Volatile Constituent." Following up the work previously done in the Department of Glass Technology, Sheffield, the present work was undertaken to investigate the effect on the amount of selenium needed as decolorizer in a soda–lime–silica glass. It was found that a distinct falling off in colour occurred with 10 parts of ammonium sulphate per 1000 of sand. Further melts showed that barium selenite was more effective than the sodium compound which, in turn, was somewhat better than selenium. Glass decolorized satisfactorily with the sodium salt, was pink when barium selenite was used, while the use of the zinc compound gave a fairly good colour and the calcium compound produced a distinct green tint.

CORRESPONDENCE

UNIFICATION OF CHEMICAL SOCIETIES

SIR,—The question of unification of chemical societies appears to have been completely smothered by the Dusts, Smokes, Mists, and Fogs which have occupied your columns of late.

In a previous letter I drew attention to the spineless indifference exhibited by the average chemist towards this essential and vital subject of unification. It is safe to say that 99% of the members of any given society have never thought of or discussed the subject away from any meeting.

Unification is a big thing, and it must be brought about slowly. It cannot be rushed through during a couple of meetings if a satisfactory result is desired. It is not needed that floods of schemes to accomplish this evolve from every member. Each society has the necessary organization to promote and formulate its views and demands, a general chemical council called from all societies—or those intending to give a lead—could sift matters out. I think I am correct in saying that very similar views were put out by that live organization, the B.A.C., some nine years ago.

I am, Sir, etc.,

J. P. LAWRIE

London, N.W.
Jan. 6, 1933

VACUUM DESICCATORS

SIR,—I was interested to read in your issue of December 23 of Prof. Gibson's experience with a vacuum desiccator. I had a similar one in the case of a vacuum desiccator which I had used for many years but which one day, without any provocation, collapsed with a loud bang. Luckily it was in a cupboard, so that no one was hurt. It would be of value if Prof. Gibson would give details as to the steel net which he recommends for preventing accidents from this cause.

I am, Sir, etc.,

F. M. HAMER

Wealdstone, Middlesex
Jan. 5, 1932

PERSONAL AND OTHER ITEMS

The University of Liverpool has awarded the degree of Ph.D. in the Faculty of Science to R. W. Brookfield (Biochemistry), B. T. Cromwell (Biochemistry), W. J. Loughlin (Physical Chemistry), A. M. Maiden (Inorganic Chemistry), S. R. A. Saletore (Industrial Chemistry), E. T. Webster (Organic Chemistry), A. G. Winn (Physical Chemistry); and in the Faculty of Engineering to T. B. Wilkinson (Metallurgy).

We regret to announce the death on January 1, after a long illness, of Mr. Thomas Tucker. Mr. Tucker, who was 72 years of age, had been a member of the Society since 1918, and was known to many members by his association with the Stirling Works, Stratford, of the old-established chemical manufacturing works of Thomas Tyer & Co., Ltd., of which he was director and general manager.

We regret to record the death in France on December 22 of Dr. Edward Heberlein, director of several mining companies, and a noted metallurgist. Dr. Heberlein held the D.Sc. degree of Zurich University and was for several years associated with the firm of H. J. Enthoven & Sons of Rotherhithe.

We regret to record the death in America of Dr. Ernest Howe, a noted geologist and professor at Yale University. He served for some years in the U.S. Geological Survey and later became a consulting mining engineer, and was at one time editor of the *American Journal of Science.*

Birmingham Chemists' Annual Concert

The annual concert organized at Birmingham by Mr. J. R. Johnson and the Committee of the British Association of Chemists and the Institute of Chemistry has always been a most enjoyable occasion. The concert is being held again this year on January 17, at

7.30 p.m., in the Midland Hotel, Birmingham, with the additional co-operation this year of the Committee of the Nottingham Section of this Society. Members who desire to attend are asked to notify Mr. G. King, 39, Upland Road, Selly Park, Birmingham, not later than January 15.

Institution of Chemical Engineers

A meeting of the Institution of Chemical Engineers will be held in the Rooms of the Chemical Society, Burlington House, on Wednesday, January 25, 1933, when the subject of "Sewage Disposal" will be treated in the following papers: "British Practice in Sewage Disposal," by Mr. H. C. Whitehead, M.Inst.C.E., and Mr. F. R. O'Shaughnessy, F.I.C.; "Sewage Treatment in America," by Mr. L. R. Howson: "German Practice in Sewage Disposal," by Dr.-Ing. Karl Imhoff.

The subject of sewage disposal is one of practical importance to chemical engineers in all countries, and it is believed the opportunity for the comparison of methods employed in different parts of the world will prove of wide interest.

Members of this Society are cordially invited to attend.

British Standard Specifications

Two new B.S. Specifications have recently been issued by the British Standards Institute. The first of these (B S.S. No. 474—1932) deals with synthetic resin of the phenol-aldehyde type. The advent of synthetic resin has given the electrical industry a valuable insulating material for paper boards and cylinders, but to be of the fullest use to the industry the resin must possess both insulating and adhesive properties, and it is in the matter of adhesiveness that the resin sometimes fails. This is the first B.S. Specification for this class of insulating material, and the requirements have wisely been limited to a few essential properties, and the testing methods specified are as simple as practicable. An electric strength test on varnished tissue paper is specified and the specification also covers definitions of "green" and "liquid" resin, strength of solution obtainable under given conditions, tolerance on melting point—it being not possible to specify a definite melting point in view of users' varying requirements—and a clause to limit the amount of untransformed resin after a given heat treatment. The second specification (B.S.S. 156—1932) constitutes a revision of that issued in 1922 for enamelled high-conductivity copper wire. All the tests given in the original specification have been retained, but a clause covering joints has been added, and the methods of carrying out mechanical tests approximate more closely to practical conditions. The requirements regarding freedom from pinholes have been made more stringent and the test for inflammability of the enamel has been improved. Copies of the Specifications can be obtained from the British Standards Institute, 28, Victoria Street, price 2s. 2d., post free.

International Society of Leather Trades Chemists

The following officers of the British Section of the I.S.L.T.C. have been elected for 1933: *President*, Dr. A. Turnbull: *Vice-President*, Mr. M. C. Lamb: *Treasurer*, Dr. D. Burton, Rose Hill Tannery, Bolton, Lancs: *Hon. Secretary*, R. Faraday Innes, F.I.C.: *Members of Committee:* Dr. R. H. Marriott, Mr. R. O. Phillips (*ex officio*), Mr. F. C. Thompson (President 1932), Mr. A. B. Craven (President 1930—31).

Pharmaceutical Chemistry

The first School of Pharmaceutical Chemistry in India has recently been started at the Benares Hindu University with the object of providing a thorough training in the theory and practice of manufacture of pharmaceuticals, and to undertake investigation of indigenous drugs and medicinal plants. An additional function of the School will be to train public analysts, so that when legislation is enacted to control the manufacture and sale of drugs, trained men will be available to carry out the work.

Redfern's Travellers' Conference

The representatives of the Rubber and Ebonite Department of Redfern's Rubber Works, of Hyde, Cheshire, held a conference recently at the works, which was addressed by Mr. T. H. Redfern, director, and also by Mr. Richard Breerton, sales manager, who gave an outline of the progress made in the use of rubber and ebonite in industry, especially by firms making electrical goods, and those concerned with the handling of acids. It was announced that the plant of Redfern's for the production of mechanical goods in rubber and ebonite was being extended.

REVIEW

Colorimetry: Its Applications in Analytical and Clinical Practice. By Dr. H. Freund. English Translation by F. Bamford, B.Sc. Pp. 255. Distributors in Gt. Britain, E. Leitz, 20, Mortimer Street, London, W.1. 1932. 10s.

For this useful little book we are indebted to Mr. Bamford of the Egyptian Government Chemical Laboratory who has translated Dr. Freund's work. It is a collection of colorimetric methods applicable to the determination of many and varied substances of interest in biochemistry, in medicine, and in food, agricultural, water, and metallurgical analysis. The fact that more than 100 colorimetric methods are described in detail shows how useful such processes may be (and there are many others which come to mind at once which have not been included); so we may well be grateful to the author and translator for collecting them in such a handy form. Most of the determinations can be carried out with very simple colorimeters or even with Nessler glasses.

In the main the descriptions are clear and the translation good, though there are some obscure points in the introductory portion dealing with colorimeters. We hope that in the next edition the author will include many useful processes now omitted (some of these are being notified privately to him as he so requests in his preface), that to make room for them he will delete some of the alternative methods and leave only the best; there are some few methods which no careful analyst would dream of using, such as those given for the determination of lactose and sucrose in condensed milk.

There is a full table of contents but we hope that in the millennium the then D.O.R.A. will prohibit the publication of text books without an index. H. E. Cox

MARKET REPORT

This Market Report is compiled from special information received from the manufacturers concerned.

Unless otherwise stated, the prices quoted below cover fair quantities net and naked at sellers' works.

The following alterations in prices are reported since the publication of the last Market Report (cf. CHEM. & IND., Jan. 6, 1933, p. 17).

RUBBER CHEMICALS

Piperidine Rubber Accelerators. P.P.D. 10s. 6d. 11s. 6d. per lb.; Z.P.D.—7s. 7s. 6d. per lb.; L.P.D.—6s. 6d.—7s. per lb.; P.T.D.—9s. 8d.—10s. 4d. per lb.; C.P.D.—8s. 3d.—8s. 10d. per lb.; S.P.D. 8s. 1d.—8s. 7d. per lb.; P.T.M.—11s. 6d.—12s. 6d. per lb.

Zinc Sulphide.—1s. 1d.—1s. 2d. per lb., according to quality.

TAR PRODUCTS

Acid Carbolic.—Crystals.—9d.—10d. per lb. Crude 60's, 1s. 11d.—2s., 2% water, 2s. 5d. per gal.

Acid Cresylic, 99/100.—1s. 7d.—1s. 8d. per gal. Refined, 1s. 9d. 1s. 11d. per gal. Pale, 98%, 1s. 5d.—1s. 7d. per gal. Dark, 1s. 2d.—1s. 3d. per gal.

PHARMACEUTICAL AND PHOTOGRAPHIC MATERIALS

Acid, Citric.—9¾d. per lb. Less 5%.

Bismuth Salts.—Carbonate, 6s. 10d. per lb.; Citrate, 9s. 3d. per lb.; Nitrate (cryst.), 4s. 7d. per lb.; Oxide, 10s. 6d. per lb.; Salicylate, 7s. 7d. per lb.; Subchloride, 10s. 3d. per lb.; Subgallate, 7s. 3d. per lb.; Subnitrate, 5s. 11d. per lb. Above for cwt. lots. Extra and reduced prices for smaller and larger quantities respectively. Liquor Bismuthi, P.B., in W. Qts.—1s. 1½d. per lb.; 6 W. Qts.—11d. per lb.; 12 W. Qts.—9½d. per lb.; 36 W. Qts.—9d. per lb.

Iodine Resub., B.P.—15s. 2d.—19s. 3d. per lb.

Iodoform, B.P., Cryst., Precip. or Powder.—18s. 2d.—22s. 2d. per lb.

Phenacetin.—4s. 6d. per lb.

Potass. Iodide, B.P.—13s. 5d.—15s. 11d. per lb., according to quantity.

Sodium Iodide, B.P.—14s. 5d.—17s. 6d. per lb.

ESSENTIAL OILS

Almond.—Foreign S.P.A., 11s. 6d. per lb. Anise.—2s. 2d. per lb. Bergamote.—8s. per lb. Bourbon Geranium, 24s. 6d. per lb.

Camphor.—Brown, 90s. per cwt. White, 90s. per cwt. Cananga, Java, 11s. per lb. Cinnamon Oil.—4s. 3d. per lb. Cassia, 80/85%, 4s. 3d. per lb.

Citronella Oil.—Java, 3s. per lb. Ceylon, 2s. 4d. per lb. Clove—90/92% English, 4s. 10d. per lb.

Eucalyptus, Australian B.P., 70/75%.—1s. per lb. Lavender.—Mont Blanc, 38/40%.—11s. 3d. per lb. Lemon—5s. 6d. per lb. Lemongrass—3s. per lb. Orange, Sweet.—6s. 6d. per lb. Otto of Rose.—Anatolian, 42s. 6d. per oz.; Bulgarian, 62s. 6d. per oz. Palma Rosa, 9s. 6d. per lb.

Peppermint.—Japanese, 6s. 9d. per lb. Wayne County, 14s. per lb. Petitgrain.—6s. 3d. per lb.

GENERAL NOTES

Official Trade Intelligence

The Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, has received the following inquiries for British goods. British firms may obtain further information by applying to the Department and stating the specific number. *Brazil:* Paint (28). *British India:* Paper (Director-General, India Store Department, Belvedere Road, Lambeth, S.E.1). *Canada:* Casein glue (5). *Denmark:* Tinplate (18). *Portugal:* Tinplate (23). *South Africa:* Pig iron (G.X. 12,173).

B.D.H. Vitamin Products

During the last year or two considerable progress has been made in the science of nutrition, and one aspect of this development has been the commercial production of vitamin-containing materials. The British Drug Houses, Ltd., has taken a prominent part in the research on, and production of, such materials and a booklet which this firm has now published will be of considerable interest to those concerned with dietetics. The booklet deals mainly with the product Radiostoleum, supplying vitamins *A* and *D*, through the administration of which it has been established that the epithelial lining tissues of the body are fortified against attacks of invading micro-organisms. The booklet also contains information with regard to Radio-Malt, containing vitamins *A*, B_1, B_2, and *D*, Radiostal (vitamin-*D*) and Aveolum (vitamin-*A*). Information is given regarding the constitution of these products and their application in general practice.

Erratum

It is regretted that in the advertisement of the new Impulsor Emulsifier shown on page xviii of last week's issue the name of the company was incorrectly given. The title of the company is The Improved Emulsification Process Co., Ltd., and the address is 25, Longford Street, London, N.W.1.

PUBLICATIONS RECEIVED

DIE LUFTSTICKSTOFF-INDUSTRIE MIT BERÜCKSICHTIGUNG DER CHILENISCHEN INDUSTRIE UND DES KOKEREISTICKSTOFFS. By Dr.-Ing. B. Waeser. 2nd ed. Pp. viii + 509. Leipzig: O. Spamer, 1932. Paper, 30 rm.; bound, 33 rm.

CHEMIE DER ZEMENTE (CHEMIE DER HYDRAULISCHEN BINDEMITTEL). By Dr. K. E. Dorsch. Pp. v + 277. Berlin: J. Springer, 1932. Paper, 23.50 rm.; bound, 25 rm.

COURS DE CHIMIE. PART II. MÉTAUX. By J. Lamirand and H. Pariselle. Pp. xx + 382. Paris: Masson et Cie, 1933. 60 fr.

A COMPREHENSIVE TREATISE ON INORGANIC AND THEORETICAL CHEMISTRY. By J. W. Mellor, D.Sc., F.R.S. Vol. XII. Pp. xii + 944. London: Longmans, Green & Co., 1932. 63s.

SIMPLE RULES FOR PAINTING IN OILS. By A. P. Laurie, M.A., D.Sc., LL.D. Pp. 46. London: Winsor & Newton, Ltd., 1932.

DER EINFLUSS DER HANDELSDÜNGER AUF DAS PFLANZENWACHSTUM UND AUF VERSCHIEDENE EIGENSCHAFTEN KALKARMER MINERALBÖDEN. By Dr.-Ing. L. Schmitt. Pp. 186. Berlin: Verlagsgesellschaft für Ackerbau, 1932. 9 rm.

LA RÉGÉNÉRATION ET LES PROBLÈMES DE LA MORPHOGENÈSE. By M. Abeloos. COLLECTION DES ACTUALITÉS BIOLOGIQUES. Under the direction of R. Lévy. Pp. xi + 253. Paris: Gauthier-Villars & Cie, 1932. 50 fr.